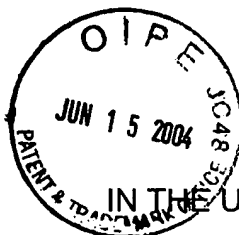


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06-16-00

18 DEC 13
PATENT

IN RE APPLICATION OF : Calabrese, et al.
FOR : APPARATUS, METHOD AND SYSTEM
FOR MAINTAINING CALL CONTROL
AT A GATEWAY MOBILE SWITCHING
CENTER UTILIZING A PACKET
NETWORK
SERIAL NO. : 09/558,613
FILED : April 26, 2000
EXAMINER : Rasha S. Al Aubaidi
ART UNIT : 2642
CONFIRMATION NO. : 9462
ATTORNEY DOCKET NO. : LUTZ 2 00133
Case Name/No. Calabrese 10-3-7-16

RECEIVED

JUN 21 2004

OFFICE OF PETITIONS

PETITION TO ESTABLISH PRIOR RECEIPT IN THE
PATENT AND TRADEMARK OFFICE OF ITEM APPARENTLY
CONSIDERED OMITTED BY THE PATENT AND TRADEMARK OFFICE

Mail Stop Petition
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Adjustment date: 09/02/2004 AKELLEY
06/17/2004 JADD01- 00000006 09558613
01 FC:1460 Dear Commissioner: OP

Repln. Ref: 09/02/2004 AKELLEY 0011084500
DAH:060308 Name/Number:09558613
FC: 9204 \$130.00 CR

This petition is initiated and filed by applicants after investigation of a first Office Action mailed March 15, 2004 for the above-identified patent application, investigation of historical records for this patent application maintained by outside counsel for Lucent Technologies, Inc. (assignee), and investigation of the file history maintained at the Patent and Trademark Office (PTO). The applicants file this petition

05/17/2004 JADD01 00000006 09558613

01 FC:1460

130.00 CR

to respectfully invoke the supervisory authority of the PTO under 37 CFR §1.181(a)(3) and/or 37 CFR §1.182. The Commissioner is respectfully requested to:

- i) order the originally-filed 30-page specification, claims, and abstract be entered into the file history maintained at the PTO,
- ii) order the 35-page specification, claims, and abstract currently found in the file history maintained at the PTO be expunged or otherwise removed,
- iii) order the above-identified patent application to continue to be accorded the original April 26, 2000 filing date after these actions, and
- iv) order the pending Office Action mailed March 15, 2004 for the above-identified patent application be vacated or otherwise withdrawn.

The applicant finds MPEP §601.01(d) and 37 CFR §1.53(e) useful as guidelines for this situation, even though this is not a response to a "Notice of Incomplete Application" or "Notice of Omitted Items" from the PTO.

Statement of Facts

The above-identified patent application was filed on April 26, 2000 by Nancy R. Gamburd, Reg. No. 38,147, Patent Attorney, of Gamburd & Associates, Ltd. via Express Mail No. EK429074425US. This Express Mail package included:

- i) a transmittal cover letter (Exhibit 1),
- ii) a specification, claims, and abstract (Exhibit 2),
- iii) a set of informal drawings (Exhibit 3),
- iv) an executed declaration and power of attorney (Exhibit 4),
- v) an executed assignment and cover sheet (Exhibit 5), and
- vi) a return postcard (Exhibit 6).

The originally-filed specification, claims, and abstract (Exhibit 2) was 30 pages as indicated on the transmittal cover letter (Exhibit 1) and the return postcard (Exhibit 6). Additionally, the originally-filed specification and abstract (Exhibit 2) is entitled "Apparatus, Method and System for Maintaining Call Control at a Gateway Mobile Switching Center Utilizing a Packet Network."

Receipt of the Express Mail package was confirmed when the return postcard (Exhibit 6) was received by Attorney Gamburd. The return postcard (Exhibit 6) includes a PTO label indicating that serial no. 09/558,613 was assigned to the above-identified patent application and that April 26, 2000 was the filing date. The return postcard (Exhibit 6) is postmarked May 2, 2000. Notably, the "specification, claims, and abstract (30 pages)" item on the return postcard (Exhibit 6) is not annotated. This indicates that the originally-filed 30-page specification, claims, and abstract (Exhibit 2) was received by the PTO.

Exhibits 1-6 were copied from the historical records for this patent application maintained by outside counsel for Lucent. A declaration by Attorney Gamburd (Exhibit 7) confirms the foregoing facts and provides additional support that Exhibit 2 is the originally-filed 30-page specification, claims, and abstract for patent application serial no. 09/558,613, filed on April 26, 2000.

European patent application no. 01303679.3, entitled "Apparatus, Method and System for Maintaining Call Control at a Gateway Mobile Switching Center Utilizing a Packet Network," was filed on April 23, 2001 by Lucent. This European application was published as document no. EP 1 150 522 (Exhibit 8). The applicant (i.e., Lucent) claimed priority to U.S. patent application serial no. 558,613, filed on April 26, 2000. When comparing the specifications, claims, and abstracts of Exhibits 2 and 8, one finds that paragraph numbers were added in Exhibit 8 and that the number of claims was reduced from 56 claims in Exhibit 2 to 32 claims in Exhibit 8. Nevertheless, one recognizes that the originally-filed 30-page specification, claims, and abstract (Exhibit 2) was filed in the European Patent Office on April 23, 2001 because the same text in the specification, claims, and abstract of Exhibit 8 is also found in Exhibit 2.

On October 29, 2002, the applicants filed an associate power of attorney and change of correspondence address (Exhibit 9) with the PTO for the above-identified patent application in conjunction with transfer of patent prosecution from Gamburd & Associates to Fay, Sharpe, Fagan, Minnich & McKee, LLP (Fay Sharpe), 1100 Superior Avenue, Seventh Floor, Cleveland, OH 44114-2518. On November 8, 2002, the PTO mailed a corrected filing receipt (Exhibit 10) to the applicants showing the Fay Sharpe's correspondence address.

On November 26, 2002, the applicants filed a request for corrected filing receipt (Exhibit 11) with the PTO. The request pointed out that: i) Inventor Hudepohl's name was spelled wrong, ii) the total number of claims should be 56, rather than 54, iii) the number of independent claims should be five (5), rather than four (4), and iv) the filing fee received should be \$1494, rather than \$1380. In response, on December 16, 2002, the PTO mailed a corrected filing receipt and a response to request for corrected filing receipt (Exhibit 12) to the applicants. The corrected filing receipt (Exhibit 12) showed Inventor Hudepohl's name spelled correctly. The response to request for corrected filing receipt (Exhibit 12) indicated that the number of claims (i.e., 54 total claims and four (4) independent claims) and the filing fee (i.e., \$1380) reflected on the filing receipt was correct. The PTO explained that the number of claims (i.e., 56 total claims and five (5) independent claims) and the filing fee (i.e., \$1494) identified in the request for corrected filing receipt (Exhibit 11) was a miscalculation by the applicants. Notably, the filing receipts (Exhibits 10 and 12) both showed the correct number of drawings (see Exhibits 1, 2, 3, and 6), the correct applicants (see Exhibits 1, 4, 5, and 6), and the correct title (see Exhibits 1, 2, 4, 5, and 6). At that time, the applicants had reason to believe that this minor discrepancy related to the number of claims could be resolved with an Examiner after an Office Action was issued. The applicants had no reason to believe, at that time, that the specification, claims, and abstract in the file history maintained by the PTO was not the originally-filed 30-page specification, claims, and abstract (Exhibit 2) from this minor discrepancy. Indeed, once a filing receipt was issued for the above-identified patent application, it was reasonable for the applicants to believe that the Office of Initial Patent Examination (OIPE) had:

- i) confirmed that the title on the specification, claims, and abstract in the file history maintained by the PTO matched the title identified in the transmittal cover letter (Exhibit 1) and executed declaration and power of attorney (Exhibit 4) and

- ii) confirmed that the specification, claims, and abstract in the file history maintained by the PTO were consistent with the drawings (Exhibit 3).

On March 15, 2004, the PTO mailed a first Office Action (Exhibit 13) on the above-identified patent application to the applicants. This Office Action (Exhibit 13) indicated that claims 1-54 were pending in the application and discussed various grounds for rejection. Referring now to Exhibit 15, Alan C. Brandt, Reg. No. 50,218, Patent Attorney, of Fay Sharpe began reviewing the Office Action (Exhibit 13) in April 2004. Attorney Brandt noticed that the grounds for rejection referred to specific language in the claims and that the same specific language could not be found in the claims of the originally-filed 30-page specification, claims, and abstract (Exhibit 2). Additionally, Attorney Brandt found a discrepancy between the Office Action (Exhibit 13) and the originally-filed 30-page specification, claims, and abstract (Exhibit 2) as to the total number of claims pending. There were 56 total claims in the originally-filed 30-page specification (Exhibit 2) and the Office Action (Exhibit 13) indicated that only 54 claims were pending. The Office Action (Exhibit 13) stated that any inquiries concerning PTO communications for the above-identified patent application should be directed Examiner Rasha S AL-Aubaidi or Supervisory Patent Examiner Ahmad Matar.

With continuing reference to Exhibit 15, on April 7, 2004, Attorney Brandt contacted Examiner AL-Aubaidi by telephone to discuss this matter. Attorney Brandt and Examiner AL-Aubaidi compared claim 1 from the specification, claims, and abstract in the file history maintained at the PTO to claim 1 in the originally-filed 30-page specification, claims, and abstract (Exhibit 2) and found that they were not the same. Attorney Brandt and Examiner AL-Aubaidi also compared the total number of claims in the specification, claims, and abstract in the file history maintained at the PTO to the total number of claims in the originally-filed 30-page specification, claims, and abstract (Exhibit 2) and found that they were not the same. There were 54 total claims in the specification, claims, and abstract in the file history maintained at the PTO and 56 total claims in the originally-filed 30-page specification, claims, and abstract (Exhibit 2). Attorney Brandt and Examiner AL-Aubaidi agreed to discuss this matter further after each had an opportunity to investigate their respective files.

On April 12, 2004 Attorney Brandt and Examiner AL-Aubaidi discussed this matter again via telephone. Examiner AL-Aubaidi indicated that she had not found anything in the file history maintained at the PTO to explain the problem. Attorney

Brandt indicated that he had not found anything in the historical records maintained by outside counsel for this patent application that might explain why the claims from the originally-filed 30-page specification, claims, and abstract were not in the PTO's file. Attorney Brandt indicated that he had found U.S. Pat. No. 6,307,929, Serial No. 09/558,578 (Exhibit 14). Attorney Brandt also indicated that the '929 patent (Exhibit 14): i) includes claims that seem to match up to the specific language referred to in the Office Action (Exhibit 13), ii) was filed on April 26, 2000, iii) was issued on October 23, 2001, and iv) was assigned on its face to Lucent. Attorney Brandt requested that Examiner AL-Aubaidi check the number of pages in the specification, claims, and abstract in the file history maintained at the PTO. Examiner AL-Aubaidi indicated that there were 35 pages in the specification, claims, and abstract in the file history maintained at the PTO. Attorney Brandt indicated that there were 30 pages in the originally-filed specification, claims, and abstract (Exhibit 2). Attorney Brandt and Examiner AL-Aubaidi discussed the title on the specification, claims, and abstract in the file history maintained by the PTO and found that it was the same as the title on the '929 patent (Exhibit 14). The title for both was found to be "Apparatus, Method and System for Providing Conditional Answering in Multiple Leg Telecommunication Sessions." Notably, the title on the originally-filed 30-page specification, claims, and abstract (Exhibit 2) is "Apparatus, Method, and System for Maintaining Call Control at a Gateway Mobile Switching Center Utilizing a Packet Network." Examiner AL-Aubaidi requested that Attorney Brandt fax the claims from the originally-filed 30-page specification, claims, and abstract (Exhibit 2) to her so she could discuss this matter with Supervisor Matar.

On April 15, 2004, Supervisor Matar and Examiner AL-Aubaidi contacted Attorney Brandt by telephone. Examiner AL-Aubaidi indicated that she had not found the originally-filed claims faxed to her in the file history maintained at the PTO or in any patent application file that she thought might have been related. Supervisor Matar and Examiner AL-Aubaidi indicated that they had compared the application in the file history maintained at the PTO for the above-identified patent application with the '929 patent (Exhibit 14) and that the specification and claims appeared to be the same, but that the drawings were different. Attorney Brandt informed Supervisor Matar and Examiner AL-

Aubaidi that the historical records maintained by outside counsel included a return postcard (Exhibit 6) from the PTO indicating that a 30-page specification, claims, and abstract was received by the PTO and that Examiner AL-Aubaidi had indicated that the specification, claims, and abstract in the file history maintained at the PTO was 35 pages. Attorney Brandt asked Supervisor Matar if he would enter the originally-filed 30-page specification, claims, and abstract into the record. Supervisor Matar indicated that he could not grant the original filing date to any specification, claims, and abstract submitted now and that this would be a matter for the Petitions Office to decide. Thus, since April 15, 2004, the applicants have taken a course of action to fully investigate this matter and prepare this petition.

A declaration by Attorney Brandt (Exhibit 15) confirms the foregoing facts of April 2004 and provides additional support for when this matter was identified and when the applicants became aware that it would be necessary to prepare this petition.

The applicants obtained a copy of the file history maintained at the PTO for the above-identified patent application in May 2004. The PTO file history included: i) a transmittal cover letter (Exhibit 16), ii) a 35-page specification, claims, and abstract (Exhibit 17), iii) a set of informal drawings (Exhibit 18), and iv) an executed declaration and power of attorney (Exhibit 19). Notably, the transmittal cover letter (Exhibit 16), set of informal drawings (Exhibit 18), and executed declaration and power of attorney (Exhibit 19) from the PTO file history match the corresponding originally-filed transmittal cover letter (Exhibit 1), set of informal drawings (Exhibit 3), and executed declaration and power of attorney (Exhibit 4). However, the 35-page specification, claims, and abstract (Exhibit 17) from the PTO file history does not match the originally-filed 30-page specification, claims, and abstract (Exhibit 2). We also note that the title on pages 1 and 35 of the 35-page specification, claims, and abstract (Exhibit 17) from the PTO file history does not match the title on the transmittal cover letter (Exhibit 16) and executed declaration and power of attorney (Exhibit 19) from the PTO file history. Moreover, pages 6 and 7 of the 35-page specification, claims, and abstract (Exhibit 17) from the PTO file history identify Figures 1A, 1B, 1C, 2, 3, 4, and 5, while the set of informal drawings (Exhibit 18) from the PTO file history provide Figures 1, 2, 3, 4, 5, 6, and 7.

Points to be Reviewed

The applicants respectfully request review of the evidence presented herein showing that the specification, claims, and abstract currently found in the file history maintained at the PTO for the above-identified patent application is not the originally-filed 30-page specification, claims, and abstract and showing that the originally-filed 30-page specification, claims, and abstract was received by the PTO. Additionally, the applicants respectfully request review of the validity of the first Office Action mailed March 15, 2004 which is based on the wrong specification, claims, and abstract.

Action Requested

The applicants respectfully request the following actions:

- i) order the originally-filed 30-page specification, claims, and abstract be entered into the file history maintained at the PTO,
- ii) order the 35-page specification, claims, and abstract currently found in the file history maintained at the PTO be expunged or otherwise removed,
- iii) order the above-identified patent application to continue to be accorded the original April 26, 2000 filing date after these actions, and
- iv) order the pending Office Action mailed March 15, 2004 for the above-identified patent application be vacated or otherwise withdrawn.

Payment of Fee

Applicants hereby submit the \$130 petition fee required under 37 CFR §1.17(h) to the PTO for consideration of this petition.


Authorization is hereby made to charge the amount of \$130 to Deposit Account No. 06-0308.

The Commissioner is hereby authorized to charge any additional fees and credit any overpayment to Deposit Account No. 06-0308. A duplicate of this paper is attached.

It is respectfully requested that, upon grant of the petition, the petition fee be refunded by a credit to the charge authorized above.

Respectfully submitted,

FAY, SHARPE, FAGAN
MINNICH & McKEE, LLP



Joseph D. Dreher
Reg. No. 37,123
1100 Superior Ave., 7th Floor
Cleveland, Ohio 44114
Tel. (216) 861-5582
Fax (216) 241-1666

CERTIFICATE OF MAILING

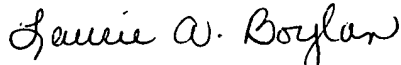
I certify that this Petition for Extension of Time Under 37 C.F.R. 1.136(a) is being

☐ deposited with the United States Postal Service as First Class mail under 37 C.F.R. § 1.8, addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date indicated below.

☐ transmitted via facsimile under 37 C.F.R. § 1.8 on the date indicated below.

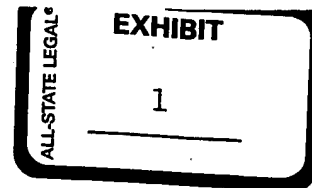
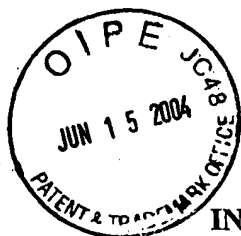
☒ deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 C.F.R. 1.10 on the date indicated below and is addressed to: MAIL STOP PETITION, Commissioner For Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Express Mail Label No.: EL 964455208 US
Date June 15, 2004

Signature 
Printed Name Laurie A. Boylan

EXHIBITS

1	Transmittal Cover Letter(Originally-filed)
2	Specification, Claims, and Abstract - Apparatus, Method and System for Maintaining Call Control at a Gateway Mobile Switching Center Utilizing a Packet Network (Originally-filed)
3	Informal Drawings (Originally-filed)
4	Declaration and Power of Attorney (Originally-filed)
5	Assignment and Cover Sheet (Originally-filed)
6	Return Postcard (Originally-filed)
7	Declaration of Attorney Nancy R. Gamburd in Support of Petition to Establish Prior Receipt in the Patent and Trademark Office of Item Apparently Considered Omitted by the Patent and Trademark Office
8	European Patent Application EP 1 150 522
9	Associate Power of Attorney (37 CFR 1.34) and Change of Correspondence Address
10	Corrected Filing Receipt – Date Mailed 11/08/2002
11	Request for Corrected Filing Receipt
12	Corrected Filing Receipt and Response to Request for Corrected Filing Receipt – Date Mailed 12/16/2002
13	Office Action – Date Mailed 03/15/2004
14	U.S. Patent No. 6,307,929
15	Declaration of Attorney Alan C. Brandt in Support of Petition to Establish Prior Receipt in the Patent and Trademark Office of Item Apparently Considered Omitted by the Patent and Trademark Office
16	Transmittal Cover Letter (PTO)
17	Specification, Claims, and Abstract - Apparatus, Method and System for Providing Conditional Answering in Multiple Leg Telecommunication Sessions (PTO)
18	Informal Drawings (PTO)
19	Declaration and Power of Attorney (PTO)



Express Mail No. EK429074425US
Calabrese 10-3-7-16

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT APPLICATION

INVENTORS: Calabrese, Robert Thomas
Hudepohl, Thomas Edward
Riley, Douglas Harvey
Thompson, Robin Jeffrey

CASE: Calabrese 10-3-7-16

TITLE: Apparatus, Method and System For Maintaining Call Control at a
Gateway Mobile Switching Center Utilizing a Packet Network

ASSISTANT COMMISSIONER FOR PATENTS
WASHINGTON, D.C. 20231

SIR:

Enclosed are the following papers relating to the above-named application for patent:

Specification, Claims and Abstract (30 pages)
7 Sheets of informal drawings
Assignment with Cover Sheet
Declaration and Power of Attorney

CLAIMS AS FILED

The fee has been calculated as shown below:

Small Entity							Large Entity	
FOR	No. Filed	No. Allowed	No. Extra	Rate	Fee	OR	Rate	Fee
Basic Fee					\$345.00	OR		\$690.00
Total Claims	56	- 20 =	36	x \$9.00	\$	OR	x \$18.00	\$648.00
Independent Claims	5	- 3 =	2	x \$39.00	\$	OR	x \$78.00	\$156.00
Multiple Dep. Claims				+\$130.00	\$	OR	+ \$260.00	\$0.00
Other Fees				\$	\$	OR	\$	\$0.00
TOTAL					\$	OR	TOTAL	\$1,494.00

Please file the application and charge Lucent Technologies, Inc. Deposit Account No. 12-2325 the amount of \$1,494.00 to cover the filing fee. Duplicate copies of this letter are

Express Mail No. EK429074425US
Calabrese 10-3-7-16

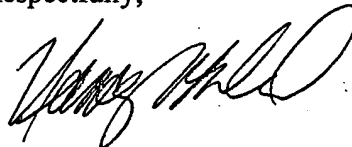
enclosed. In the event of non-payment or improper payment of required fee, the Commissioner is authorized to charge or to credit Deposit Account No. 12-2325 as required to correct the error.

Please address all correspondence to:

Nancy R. Gamburd
Gamburd & Associates, Ltd.
10 South LaSalle Street, Suite 3300
Chicago, Illinois 60603-1002

Telephone calls should be made to me at (312) 372-2920 extension 125.
Faxes should be transmitted to me at (312) 372-7762.

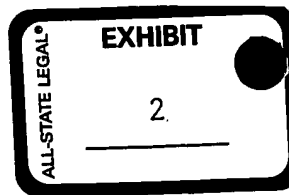
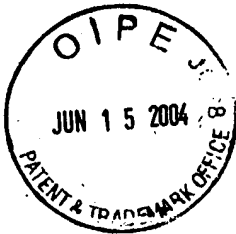
Respectfully,



Nancy R. Gamburd
Registration No. 38,147
Attorney for Applicants

Date: April 26, 2000

Lucent Technologies Inc.
600 Mountain Avenue
P.O. Box 636
Murray Hill, New Jersey 07974-0636



EK429074425US

**APPARATUS, METHOD AND SYSTEM FOR MAINTAINING
CALL CONTROL AT A GATEWAY MOBILE SWITCHING CENTER
UTILIZING A PACKET NETWORK**

Field of the Invention

The present invention relates, in general, to mobile telecommunication systems and, more specifically, to an apparatus, method and system for maintaining call control at a gateway mobile switching center utilizing a packet network.

Background of the Invention

In recent years, there has been an exponential growth in the use and provision of wireless telephony services, such as cellular and PCS services. With such growth, a mobile unit such as a cellular telephone may traverse different geographic regions, obtaining telecommunication services from a wide variety of service providers utilizing a wide variety of equipment.

In addition, with the advent of increasingly sophisticated mobile telecommunication services, there is a growing need to maintain control over calls to and from mobile units, such as cellular telephones, at a central location. Such central control is especially important for the implementation of advanced calling features such as call waiting, call forwarding on busy, and three-way calling. Such central control should also utilize advanced networking capability, such as use of packet networks such as asynchronous transfer mode ("ATM") packet networks or Internet protocol ("IP") packet networks.

As a consequence, a need remains for an apparatus, method and system to provide for maintaining call control, for both incoming and outgoing calls, at a designated mobile switching center, utilizing a packet network. The apparatus, method and system should also provide the capability to implement advanced calling features in a mobile environment, such as call waiting or three-way calling, without utilizing additional circuit switched network links such as trunk lines. The apparatus, method and

system should also provide for increased network efficiency, increased ease of implementation of advanced calling features, conservation of circuit switched network resources, and capability of implementation in utilizing existing network equipment.

5 **Summary of the Invention**

 The apparatus, method and system embodiments of the present invention provide for maintaining call control at a gateway mobile switching center (MSC), for roaming mobile units, utilizing a packet network or link, such as an ATM link, for bearer traffic transport. The preferred system embodiment includes a gateway MSC, a serving
10 MSC, and a base station having a wireless link with the roaming mobile unit. All incoming calls to the roaming mobile unit and outgoing calls from the roaming mobile unit are transmitted (or routed) through the gateway MSC, over a packet link created between the gateway MSC, the serving MSC, and the base station. The gateway MSC thereby maintains all call control for the roaming mobile unit for the implementation of
15 advanced calling features, such as call waiting, call forwarding on busy, and three-way calling.

 The gateway MSC includes a protocol handler for voice (PHV). For any given incoming call for the roaming mobile unit or outgoing call from the roaming mobile unit, the gateway MSC designates a specific address (or channel) on the PHV,
20 referred to as a data link connection identifier (DLCI), for use as an address for voice packets to be received from the roaming mobile unit via the base station and serving MSC; the base station also provides a base station packet address to the gateway MSC, for use as an address for voice packets to be received from the gateway MSC (through the serving MSC) for the roaming mobile unit, thereby creating a full duplex packet link.
25 The packet link provides or serves as a voice path between the base station, the serving MSC, and gateway MSC, with all communication to and from the roaming mobile unit routed through the gateway MSC. The gateway MSC thereby maintains all call control for the roaming mobile unit for the implementation of advanced calling features, such as call waiting and three-way calling.

30 In the preferred embodiment, the DLCI is included as a new parameter for ANSI-41 compatible messages, such as within Location Requests and Routing Requests.

In addition, new ANSI-41 compatible messages are also utilized, a Gateway Origination Request containing the base station packet address and a Gateway Origination Request Return Result containing the new DLCI parameter.

5 Numerous other advantages and features of the present invention will become readily apparent from the following detailed description of the invention and the embodiments thereof, from the claims and from the accompanying drawings.

Brief Description of the Drawings

10 Fig. 1 is a block diagram illustrating a first system embodiment to maintain call control at a gateway mobile switching center utilizing a packet network in accordance with the present invention.

Fig. 2 is a block diagram illustrating a second system embodiment to maintain call control at a gateway mobile switching center utilizing a packet network in accordance with the present invention.

15 Fig. 3 is a block diagram illustrating an apparatus embodiment to maintain call control at a gateway mobile switching center utilizing a packet network in accordance with the present invention.

Fig. 4 is a flow diagram illustrating a method embodiment to maintain call control at a gateway mobile switching center having an integrated HLR, utilizing a packet network, for incoming calls in accordance with the present invention.

20 Fig. 5 is a flow diagram illustrating a method embodiment to maintain call control at a gateway mobile switching center having an integrated HLR, utilizing a packet network, for outgoing calls in accordance with the present invention.

25 Fig. 6 is a flow diagram illustrating a method embodiment to maintain call control at a gateway mobile switching center having a stand-alone HLR, utilizing a packet network, for incoming calls in accordance with the present invention.

Fig. 7 is a flow diagram illustrating a method embodiment to maintain call control at a gateway mobile switching center having a stand-alone HLR, utilizing a packet network, for outgoing calls in accordance with the present invention.

30

Detailed Description of the Invention

While the present invention is susceptible of embodiment in many different forms, there are shown in the drawings and will be described herein in detail specific embodiments thereof, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the specific embodiments illustrated.

As mentioned above, a need remains to provide for maintaining call control at a designated mobile switching center, utilizing a packet network. In accordance with the present invention, an apparatus, method and system are provided which maintain call control, for both incoming and outgoing calls, at such a designated mobile switching center ("MSC"), referred to herein as a "gateway" MSC, utilizing a packet network. In the preferred embodiment, an ATM packet network is utilized to provide such call control at the gateway MSC, and to provide a packet link for bearer traffic between the gateway MSC and any serving MSC. As a consequence, in accordance with the present invention, advanced calling features, such as call waiting or three-way calling, may be implemented in a mobile environment without utilizing additional circuit switched network links such as trunk lines. The various embodiments of the present invention therefore provide for increased network efficiency, increased ease of implementation of advanced calling features, conservation of circuit switched network resources, and capability of implementation in utilizing existing network equipment.

Fig. 1 is a block diagram illustrating a first system embodiment 100 to maintain call control at a gateway MSC utilizing a packet network in accordance with the present invention. Fig. 2 is a block diagram illustrating a second system embodiment 200 to maintain call control at a gateway mobile switching center utilizing a packet network in accordance with the present invention. The systems 100 includes one or more mobile switching centers ("MSCs") 115 (in Fig. 1) and 125 (in Fig. 2) and one or more wireline switching centers 105, which may also be connected via trunk and signaling lines 160 to each other and to a broader network 110, such as a public switched telephone network ("PSTN") or an integrated services digital network ("ISDN"), providing multiple telecommunication connections to other locations, such as providing a link to a computer

150 (or other internet connection) and a link to satellite 135, such as a telecommunication satellite.

As discussed in greater detail below, in accordance with the present invention, any of the MSCs 115 and 125 may function as a gateway MSC. Incoming
5 calls to a mobile unit 130 will be routed and controlled by the gateway MSC. Outgoing calls which originate at a different, "serving" MSC (115 or 125) will be routed over an ATM link to the gateway MSC, to provide call control and advanced calling features, such as call waiting, call forwarding and three-way calling.

Referring to Figs. 1 and 2, the systems 100 and 200 may also include one
10 or more intelligent network devices referred to as adjunct network entities 120, such as a service control point ("SCP"), a service node ("SN"), an intelligent peripheral ("IP"). Another type of adjunct network entity implements database functionality, and is generally referred to as a home location register ("HLR"). As illustrated in Fig. 1, the HLR functionality is implemented utilizing stand-alone home location registers ("S-
15 HLRs") 155. In contrast, in Fig. 2, the HLR functionality is implemented in an equivalent form, utilizing integrated home location registers ("I-HLRs"), which are integrated within the MSCs 125. The adjunct network entities 120 are preferably connected or coupled to a MSC 115 (or 125), utilizing either a packet-based or a circuit switched connection. The system 100 or 200 may also have a network (such as internet)
20 connection to a computer 150 (or other network communication device). In the preferred embodiment, each MSC 115 or 125 also includes or is associated with a database referred to as a visitor location register ("VLR").

As indicated above, for the system 200 embodiment, HLR functionality is integrated into the mobile switching centers, as MSCs 125 (with I-HLRs). As discussed
25 in greater detail below, the system 200 with I-HLR functionality within the MSC 125 may utilize different messaging types for implementation of the present invention, and in all other respects is identical to the system 100 illustrated in Fig. 1.

In accordance with the present invention, the MSCs 115 or 125 are also coupled to each other through a packet-based channel, line or network, such as ATM link
30 165, which may be any type of medium, such as a fiber optic, cable or other physical medium for providing an ATM link. In the preferred embodiment, the MSCs 115 and

125 are also linked to base stations (or other wireless transceivers) 145, preferably via currently employed frame relay links 170 or other packet based systems (such as ATM) (when backwards compatibility is not required). The base stations 145, in turn, provide a wireless communications link from the MSCs 115 or 125 to the various mobile units 130, such as cellular, PCS or other wireless telephones, personal digital assistants or other wireless devices, within particular geographic regions, for voice and data communications. The wireline switching center 105 is also generally connected to a plurality of telephones 140 or other customer premise equipment, also for voice and data communications. In addition, while the wireline (105) and mobile switching centers 115 and 125 are usually physically separated due to regulatory and other historical reasons, these switching centers may also be combined into one or more switching centers having both wireline and wireless functionalities.

Continuing to refer to Figs. 1 and 2, any of the MSCs 115 or 125, for any given mobile unit 130, may be operating as a gateway MSC in accordance with the present invention. More specifically, each mobile unit 130 is generally assigned to a particular MSC (115 or 125), referred to as its home MSC, with information pertaining to that mobile unit 130 stored in a corresponding HLR, such as within an S-HLR 155 associated with the home MSC 115 or within an I-HLR of a home MSC 125. Such information, for example, may include calling features and services available to that particular mobile unit 130. Through the various corresponding base stations 145 or other wireless transceivers, each MSC 115 or 125 generally provides mobile telecommunication and other services to mobile units 130 within a particular geographic region or range. As each mobile unit 130 may roam throughout or traverse a geographic region, it may move out of the range of a particular MSC (115 or 125) and its corresponding base stations 145, and into the range of another MSC (115 or 125) with its corresponding base stations 145, with a corresponding hand off of an ongoing communication session between the MSCs (115 or 125) (via base stations 145). (Additional hand offs may also occur between base stations 145 connected to the same MSC 115 or 125).

As a consequence, when an MSC 115 or 125 is providing telecommunication and other services to a mobile unit 130 that has roamed into its range

or geographic region (*i.e.*, within range of any of its corresponding base stations 145), that MSC (115 or 125) is referred to as a serving MSC. A roaming mobile unit 130 may both initiate outgoing calls and receive incoming calls while within the range of any given serving MSC. Such a serving MSC typically stores and maintains information
5 pertaining to such roaming mobile units within the visitor database (VLR) of its associated HLR, such as a S-HLR 155 associated with an MSC 115 or an I-HLR of an MSC 125.

In accordance with the present invention, for any given mobile unit 130, a home MSC 115 or 125 will generally operate as a gateway MSC while one of its assigned
10 mobile units 130 is in another, different geographic area and is being served by a serving MSC. Any MSC 115 or 125 may function as a gateway MSC for a particular mobile unit 130, provided that it has a complete database for that mobile unit 130 and is able (or assigned) to route incoming calls for that mobile unit 130. As a consequence, any given MSC 115 or 125 may be both a gateway MSC and a serving MSC during the same period
15 of time: an MSC 115 or 125 operates as a gateway MSC when providing services to its own assigned (or home) mobile units 130 which have roamed into another region, as discussed in greater detail below; and an MSC 115 or 125 operates as a serving MSC when providing services to any mobile unit 130 within its region or range (both visiting and home mobile units 130).

The gateway functionality referred to above, in accordance with the
20 present invention, allows a gateway (home or anchor) MSC 115 or 125 to retain control over all incoming and outgoing calls to and from its assigned (or home) mobile units 130. This gateway functionality, therefore, allows the gateway MSC 115 or 125 to implement advanced calling features, such as call waiting or three-way calling, regardless of the
25 current location of any of its mobile units 130. As discussed in greater detail below, such control is maintained by creating (or routing) a voice path between a serving MSC and a gateway MSC through a packet network, such as through an ATM network or link 165. During call set up, a gateway MSC reserves or designates an address, utilizing a new parameter referred to as a data link connection identifier ("DLCI"), for use for all voice
30 and data packets for that call (*i.e.*, traffic or bearer traffic) to be transmitted to the gateway MSC from a serving MSC over the packet network. The new DLCI parameter is

preferably requested and transmitted in new message forms, respectively referred to as a gateway origination request and gateway origination return result. In the preferred embodiment, the gateway origination request and return result messages are extensions compatible with the ANSI-41 protocol or standard promulgated by the American
5 National Standards Institute.

For example, for an outgoing call from a mobile unit 130, the serving MSC (115 or 125) (via its S-HLR or I-HLR) obtains a DLCI from the gateway MSC (115 or 125). The outgoing call is then created or routed through the gateway MSC (115 or 125), by transmitting voice packets having the DLCI as an address or header from the
10 serving MSC to the gateway MSC via a packet network or link, such as via ATM link 165. During this time, the gateway MSC (115 or 125) may also receive an incoming call for the particular mobile unit 130; due to its control over the outgoing call, the gateway MSC may provide an alert to the mobile unit 130 such as a call waiting signal, may provide a call forwarding on busy, or may create a three-way (barge-in) communication
15 session. Call flows and messaging for such call control and routing are discussed in greater detail below with reference to Figs. 4 through 7.

Fig. 3 is a block diagram illustrating an apparatus embodiment 300 to maintain call control at a gateway MSC utilizing a packet network in accordance with the present invention. In the preferred embodiment, the apparatus 300 is included within an
20 MSC 115 or 125, such as within the gateway MSC 270 or serving MSC 260 illustrated in Fig. 3. The apparatus 300 includes a processor 210, a network interface 215, a memory 220, and protocol handlers for various packet-based protocols, depending upon the system 100 or 200 implementation, such as a frame relay protocol handler ("FRPH") 230, a protocol handler for voice ("PHV") 250, and a protocol handler for ATM ("PHA") 240.

25 Referring to Fig. 3, the network interface 215 is utilized to receive and transmit voice information and other data, control messages, call set up messages, and other pertinent information, to and from the network 110, and is typically designed to interface with a circuit switched network. The memory 220 may be a magnetic hard drive, an optical storage device, an integrated circuit, or any other type of data storage
30 apparatus. The memory 220 is used to store information pertaining to program instructions or configurations (discussed below), call management and call routing

information, and may include database (HLR and VLR) functionality, particularly when an HLR is implemented as an I-HLR within an MSC 125. Alternatively, in performing such HLR and VLR information storage and functionality, the memory 220 may be included within a stand-alone database, such as an S-HLR 155.

5 Continuing to refer to Fig. 3, the processor 210 may include a single integrated circuit ("IC"), or may include a plurality of integrated circuits or other components connected, arranged or grouped together, such as microprocessors, digital signal processors ("DSPs"), application specific integrated circuits ("ASICs"), field programmable gate arrays ("FPGAs"), associated memory (such as RAM and ROM), and
10 other ICs and components. As a consequence, as used herein, the term processor should be understood to equivalently mean and include a single processor, or arrangement of processors, microprocessors, controllers, or some other grouping of integrated circuits which perform the functions discussed above and also discussed in detail below with reference to Figs. 4 through 7, with associated memory, such as microprocessor memory
15 or additional RAM, DRAM, SRAM, MRAM, ROM, EPROM or E²PROM. The processor 210 with its associated memory may be configured to perform the methodology of the invention, as discussed above with reference to Figs. 1 and 2 and as discussed below with reference to Figs. 4 through 7. For example, the methodology may be programmed and stored, in the processor 210 with its associated memory (and/or memory
20 220) and other equivalent components, as a set of program instructions (or equivalent configuration or other program) for subsequent execution when the processor 210 is operative (*i.e.*, powered on and functioning). (Equivalently, when the processor 210 with its associated memory and other equivalent components are implemented in whole or part as FPGAs and/or ASICs, the FPGAs or ASICs also may be designed, configured or hard-
25 wired to implement the methodology of the invention).

Continuing to refer to Fig. 3, in the preferred embodiment, the apparatus 300 includes a frame relay protocol handler (FRPH) 230 as an interface to the base stations 145 through a frame relay link 170. (In lieu of FRPH 230, other equivalent, packet based protocol handlers may also be used, depending upon the available links or
30 channels to the various base stations 145, such as ATM links). Also in the preferred embodiment, voice information from mobile units 130 is subrate sampled by the base

stations 145 at 8K bits/second; the subrate samples are transmitted to the MSC 115 or 125 (such as serving MSC 260) via frame relay link 170, and are converted to full rate (64K bits/second) utilizing the protocol handler for voice (PHV) 250. The apparatus 300 further includes a protocol handler for ATM (PHA) 240, to maintain call control
5 functionality within the gateway MSC 270, when the various MSCs 115 and 125, such as gateway MSC 270 and serving MSC 260, are connected via an ATM link 165. Alternatively, in the event the MSCs 115 and 125 are connected through a different type of packet link, a corresponding protocol handler should be utilized in lieu of PHA 240, such as an Internet protocol (IP) handler.

10 To illustrate the ATM or other packet link between the serving MSC 260 and the gateway MSC 270, a full duplex voice path 280 (dotted line) between the MSCs is illustrated in Fig. 3. During call set up, the gateway MSC 270 reserves a channel of its PHV 250 and provides the serving MSC 260 (via HLR functionality) with a specific address for the reserved channel of the PHV 250, referred to as a data link connection
15 identifier ("DLCI"). The serving MSC 260, in turn, provides the DLCI to the base station 145 serving the mobile unit 130. Beginning with the mobile unit 130, a wireless link is created to the base station 145 which, in turn, transmits subrate voice packets to the FRPH 230 (in serving MSC 260) via frame relay link 170, with addressing designating the DLCI of the PHV 250 (in the gateway MSC 270). These frame relay voice packets
20 are transferred to the PHA 240 within the serving MSC 260, which provides the appropriate ATM formatting and addressing for the PHA 240 in the gateway MSC 270. The ATM packets are transmitted over the ATM link 165 to the PHA 240 of the gateway MSC 270; the ATM layer is stripped, and the frame relay packets are delivered to the DLCI address of the PHV 250 (of the gateway MSC 270). From the PHV 250, the
25 packets are converted to full rate (e.g., 64K/second for PCM), and transferred to the network interface 215 for transmission via the network 110.

Similarly, for incoming voice from the network, the PHV 250 of the gateway MSC 270 is provided with an address for the base station 145, with a different address for each call handled by the base station 145. Those voice packets or frames are
30 provided with ATM formatting and addressing, for transmission over ATM link 165 to

the serving MSC 260 and (via frame relay) to the serving base station 145 for wireless transmission to the mobile unit 130.

As mentioned above, as a mobile unit 130 traverses a given geographic region, it may move in or out of range of base stations 145 associated with a given MSC 115 or 125. As it does so, the mobile unit 130 typically registers with the MSC 115 or 125 providing service in the newly entered geographic region. During such registration, a serving MSC 125 receives database information from the gateway (or home) MSC 125 with I-HLR, and generates a corresponding VLR for the particular mobile unit, such as call handling instructions and triggers. For MSCs 115 with stand-alone HLRs (S-HLRs 155), the serving MSC 115 typically transmits a registration notification (ANSI-41 RegistrationNotification Invoke) to the S-HLR 155, and in response (ANSI-41 RegistrationNotification Return Result) receives this database information and also generates a corresponding VLR for the particular mobile unit, such as call handling instructions and triggers. In the preferred embodiment, a second VLR is also generated at the gateway MSC 115 or 125 by the S-HLR or I-HLR. More specifically, following transmission of the registration notification response to the serving MSC 115, the S-HLR 155 also transmits a qualification directive to the gateway MSC 115, which directive includes the VLR database information for the roaming mobile unit 130. Alternatively, a static VLR may be maintained at the gateway MSC 115, and updated by the S-HLR only when VLR impacting changes are made, such as to change an end user feature code or an administrative data entry. Following such a transmission of either the VLR database information or changes to the VLR database, the gateway MSC 115 transmits a qualification directive return result as an acknowledgement to the S-HLR. This second copy of the VLR at the gateway MSC 115 or 125 enables the gateway MSC to determine whether the roaming mobile unit 130 will have ATM voice path capability for incoming and outgoing calls. This second copy of the VLR at the gateway MSC 115 or 125 also provides a significant contrast with the prior art in which only one copy of a VLR is maintained and only at a serving MSC.

As mentioned above, and as discussed in greater detail below, a new DLCI parameter and a new message type with a corresponding response are utilized in the preferred embodiment. The DLCI parameter may be included as a new parameter within

a wide variety of ANSI-41 compatible messages types, such as location requests (with corresponding location request return results) and routing requests (with corresponding routing request return results). In addition, two new messages are also defined for the preferred embodiment: first, a "gateway origination request" (or "gateway origination request invoke") is utilized by a serving MSC to request a DLCI to establish the ATM voice path, and second, a corresponding response referred to as a "gateway origination request return result" which includes the DLCI of the reserved channel of the PHV of the gateway MSC. The gateway origination request (invoke) preferably includes ANSI-41 parameters such as Billing ID, Dialed Digits, Electronic Serial Number, Mobile Identification Number, Originating MSC Identification (MSCID) (*i.e.*, identification of the serving MSC which is originating an outgoing call from a mobile unit 130), and optionally includes parameters such as Serving Cell ID and Service Option (containing voice coder (vocoder) specific information for a particular call). The gateway origination request return result optionally includes the new DLCI parameter and other ANSI-41 parameters such as Access Denied Reason and Service Option. The various existing parameters are referenced in the subsections comprising section 6.5.2 of the ANSI-41 specification.

Fig. 4 is a flow diagram illustrating a method embodiment to maintain call control at a gateway mobile switching center 125 having an integrated HLR, utilizing a packet network, for incoming calls from a network 110 in accordance with the present invention. The method begins, step 305, with the reception of an incoming call leg (from the network 110) by the gateway MSC 125 (having an I-HLR) for a particular roaming mobile unit 130. The gateway MSC 125 reserves or allocates a channel on its PHV 250 having a corresponding or designated DLCI for addressing, step 310. With the I-HLR and VLR, the gateway MSC knows where the mobile unit 130 is registered, and as a consequence, the gateway MSC 125 then transmits a routing request invoke message containing the DLCI parameter (and identification of the mobile unit 130) to the serving MSC (115 or 125), step 315. Following a page to and response from the mobile unit 130, the serving MSC 115 or 125 transmits to the gateway MSC 125 a routing request return result (also including the DLCI parameter and a base station 145 address for packets from the gateway PHV 250 for the mobile unit 130), step 320. (In the event the serving MSC

115 or 125 determines not to utilize the ATM link, it will return a temporary location directory number (TLDN) for routing the call over circuit trunk facilities as is currently known in the art, instead of the DLCI parameter.)

Continuing to refer to Fig. 4, the serving MSC 125 provides the DLCI to
5 the base station 145 that transmits to and receives from the particular mobile unit 130, and the gateway MSC 125 (via processor 210) provides the base station packet address to its PHV 250, step 325, to establish the traffic or bearer path between the base station 145 and the gateway MSC 125 utilizing the ATM link 165 (or other ATM network). The serving MSC 125 (via base station 145) provides an alert to the mobile unit 130, step 330,
10 and when answered in step 335, provides an answer indication message to the gateway MSC 125 and provides a connection or link to the incoming call leg utilizing the ATM link 165, step 340. Packets from the mobile unit 130 are addressed to the DLCI of the gateway PHV 250, and packets from the PHV 250 are addressed to a call-specific address of the base station 145. Following step 340, the method may end, return step 350. In the
15 event the call is unanswered in step 335, and after a predetermined period of time (no answer time) has elapsed in step 345, the method may also end, return step 350.

Fig. 5 is a flow diagram illustrating a method embodiment to maintain call control at a gateway mobile switching center 125 having an integrated HLR, utilizing a packet network, for outgoing calls from roaming mobile unit 130 in accordance with the
20 present invention. The method begins, step 400, with the reception by the serving MSC 125 of a request (origination) from a roaming mobile unit 130 (transmitted via base station 145), such as through the entry of dialed digits for an outgoing call (followed by entry of SEND or TALK). The serving MSC 125 determines, from its VLR, that the particular mobile unit has a gateway origination trigger, step 405, and as a consequence,
25 the serving MSC 125 transmits a gateway origination request (invoke) (containing the identification of the mobile unit 130, the dialed digits, the service option (such as a PHV selection (such as for CDMA or TDMA)), the base station 145 address for the call, and other parameters) to the gateway MSC 125, step 410.

Continuing to refer to Fig. 5, upon reception of the request, the gateway
30 MSC 125 reserves a channel and allocates an address (DLCI) on its PHV 250, step 415, to provide call control at the gateway MSC 125 and to provide feature interactions for

incoming calls, such as call waiting or three-way calling, and provides the PHV 250 with a base station 145 address for the particular call. Next, in step 420, the gateway MSC 125 transmits a gateway origination request return result, containing the DLCI and other parameters, to the serving MSC 125. The serving MSC 125, in turn, provides the DLCI to the base station 145 serving the mobile unit 130, step 425, to establish the voice path through the ATM link 165. The gateway MSC 125 then sets up the outgoing call to the network 110 based upon subscriber data and the dialed digits, with a connection or link to the ATM voice path to the outgoing call, step 430. Packets from the mobile unit 130 are addressed to the DLCI of the gateway PHV 250, and packets from the PHV 250 are addressed to a call-specific address of the base station 145. Following step 430, the method may end, return step 435

As mentioned above, the call flow diagrams for MSCs 115 having stand-alone HLRs (Figs. 6 and 7) are slightly different than the cases (Figs. 4 and 5) involving integrated HLRs. Fig. 6 is a flow diagram illustrating a method embodiment to maintain call control at a gateway mobile switching center 115 having a stand-alone HLR 155, utilizing a packet network, for incoming calls from a network 110 in accordance with the present invention. The method begins, step 500, with the reception of an incoming call leg (from the network 110) by the gateway MSC 115 (with VLR) for a particular roaming mobile unit 130. The gateway MSC 115, through information stored in its VLR, knows that the particular roaming mobile unit 130 is registered with a serving MSC that may be able to support packet network call delivery, and as a consequence, the gateway MSC 115 reserves or allocates a channel on its PHV 250 having a corresponding or designated DLCI for addressing, step 505. The gateway MSC 115 then transmits a location request invoke message containing the DLCI parameter (and identification of the mobile unit 130) to the S-HLR 155, step 510. The S-HLR 155 then transmits a routing request invoke message containing the DLCI parameter (and identification of the mobile unit 130) to the serving MSC 115, step 515.

Continuing to refer to Fig. 6, following a page to and response from the mobile unit 130, the serving MSC 115 transmits a routing request return result (also including the DLCI parameter and a base station 145 address for the particular call) to the S-HLR 155, step 520. (In the event the serving MSC 115 determines not to utilize the

ATM link, it will return a temporary location directory number (TLDN) for routing the call over circuit trunk facilities as is currently known in the art, instead of the DLCI parameter.) The S-HLR 155 then transmits to the gateway MSC 115 a location request return result, containing the DLCI (or TLDN), the base station 145 packet address, and the VLR database profile, step 525. The serving MSC 115 then provides the DLCI to the base station 145 which transmits to and receives from the particular mobile unit 130, and the gateway MSC 115 provides the base station packet address to its PHV 250, step 530, to establish the voice path between the base station 145 and the gateway MSC 115 utilizing the ATM link 165. The serving MSC 115 (via base station 145) provides an alert to the mobile unit 130, step 535, and when answered in step 540, provides an answer indication message to the gateway MSC 115 and provides a connection or link to the incoming call leg utilizing the ATM link 165, step 545. Packets from the mobile unit 130 are addressed to the DLCI of the gateway PHV 250, and packets from the PHV 250 are addressed to a call-specific address of the base station 145. Following step 545, the method may end, return step 555. In the event the call is unanswered in step 540, and after a predetermined period of time (no answer time) has elapsed in step 550, the method may also end, return step 555.

Fig. 7 is a flow diagram illustrating a method embodiment to maintain call control at a gateway mobile switching center 115 having a stand-alone HLR 155, utilizing a packet network, for outgoing calls from roaming mobile unit 130 in accordance with the present invention. The method begins, step 600, with the reception by the serving MSC 115 of a request (origination) from a roaming mobile unit 130 (transmitted via base station 145); such as through the entry of dialed digits for an outgoing call (followed by entry of SEND or TALK). The serving MSC 115 determines, from its VLR, that the particular mobile unit has a gateway origination trigger, step 605, and as a consequence, the serving MSC 115 transmits (via the S-HLR 155) a gateway origination request (invoke) (containing the identification of the mobile unit 130, the dialed digits, the base station 145 address for the particular call, the service option (such as a PHV selection (such as for CDMA or TDMA)) and other parameters) to the gateway MSC 115, step 610.

Continuing to refer to Fig. 7, upon reception of the request, the gateway MSC 115 reserves a channel and allocates an address (DLCI) on its PHV 250, and provides its PHV 250 with the base station packet address, step 615, to provide call control at the gateway MSC 115 and to provide feature interactions for incoming calls, such as call waiting or three-way calling. Next, in step 620, the gateway MSC 125 transmits (via the S-HLR 155) a gateway origination request return result, containing the DLCI and other parameters, to the serving MSC 115. The serving MSC 115, in turn, provides the DLCI to the base station 145 serving the mobile unit 130, step 625, to establish the voice path through the ATM link 165. In the event that the gateway MSC 115 does not have a current VLR profile for the roaming mobile unit 130, step 630, the gateway MSC 115 then transmits a qualification request invoke to the S-HLR 155 to obtain the VLR profile, step 635. The S-HLR 155 then transmits to the gateway MSC 115 a qualification request return result containing the VLR profile of the roaming mobile unit 130, step 640. The gateway MSC 115 then sets up the outgoing call to the network 110 based upon subscriber data and the dialed digits, with a connection or link to the ATM voice path to the outgoing call, step 645. Packets from the mobile unit 130 are addressed to the DLCI of the gateway PHV 250, and packets from the PHV 250 are addressed to a call-specific address of the base station 145. Following step 645, the method may end, return step 650.

Following the establishment of an incoming or outgoing call through the gateway MSC (115 or 125), as illustrated in Figs. 4-7, the gateway MSC may maintain control over any advanced calling features for the mobile unit 130, such as call waiting, call forwarding on busy, busy signal, three-way calling, etc. For example, for call waiting, in the event of a new incoming call from the network 110, the gateway MSC (115 or 125) may transmit an Information Forward message to the serving MSC (115 or 125), which then provides an in-call alert to the mobile unit 130. Conversely, for mobile unit 130 initiated features, such as three-way calling, the mobile unit 130 may provide feature actions to the serving MSC (115 or 125), such as through entry of a flash or a flash with other information. The serving MSC (115 or 125) then transmits a flash request invoke to the gateway MSC (115 or 125), and the gateway MSC (115 or 125) then provides these features, such as three-way calling.

Numerous advantages of the present invention may be apparent from the above discussion. As indicated above, call control is maintained at the gateway MSC, providing the ability to implement and control advanced calling features for roaming mobile units, especially those features presented as a "line appearance" to the gateway MSC for a particular mobile unit. In addition, toggling (or switching) between multiple calls, such as in call waiting, is performed at a central location, as may be required by various service providers. Another advantage of the various embodiments of the present invention is the utilization of a packet network, such as ATM link 165, rather than circuit switched trunk lines, to create a voice path between serving and gateway MSCs. As a consequence, trunking lines are available for other services, with a corresponding increase in system capacity. In addition, the various embodiments are user friendly and user transparent.

From the foregoing, it will be observed that numerous variations and modifications may be effected without departing from the spirit and scope of the novel concept of the invention. It is to be understood that no limitation with respect to the specific methods and apparatus illustrated herein is intended or should be inferred. It is, of course, intended to cover by the appended claims all such modifications as fall within the scope of the claims.

It is claimed:

1. A method for maintaining call control at a gateway mobile switching center for a roaming mobile unit utilizing a packet network for bearer traffic transport, the method comprising:

(a) receiving an incoming call leg at the gateway mobile switching center for the roaming mobile unit;

(b) determining a data link connection identifier for a protocol handler for voice at the gateway mobile switching center;

(c) providing the data link connection identifier to a serving mobile switching center and to a base station, and obtaining from the serving mobile switching center a packet address of the base station for communication with the roaming mobile unit to create a packet link between the gateway mobile switching center and the base station;

(d) providing an alert to the roaming mobile unit; and

(e) when an answer has been received from the roaming mobile unit, providing a connection between the roaming mobile unit and the incoming call leg utilizing the packet link between the gateway mobile switching center and the base station.

2. The method of claim 1, wherein the data link connection identifier is included as a parameter within an ANSI-41 compatible message.

3. The method of claim 1, wherein step (c) further comprises:
transmitting a routing request invoke containing the data link connection identifier from the gateway mobile switching center to the serving mobile switching center; and

receiving at the gateway mobile switching center a routing request return result containing the base station packet address from the serving mobile switching center.

4. The method of claim 1, wherein step (c) further comprises:
transmitting a location request invoke containing the data link connection
identifier from the gateway mobile switching center to a stand-alone home location
register;

5 transmitting a routing request invoke containing the data link connection
identifier from the stand-alone home location register to the serving mobile switching
center;

receiving at the stand-alone home location register a routing request return
result containing the base station packet address and a data link connection identifier
10 result from the serving mobile switching center; and

receiving at the gateway mobile switching center a location request return
result containing the base station packet address, the data link connection identifier result
and a visitor location register profile from the stand-alone home location register.

15 5. The method of claim 1, wherein step (c) further comprises:
providing the base station packet address to the protocol handler for voice.

6. The method of claim 1, wherein the packet link is an asynchronous
transfer mode (ATM) protocol link.

20

7. The method of claim 1, wherein the packet link is an Internet protocol (IP)
link.

8. The method of claim 1, wherein the packet link is a frame relay protocol
25 link.

9. The method of claim 1, wherein the packet link is an asynchronous
transfer mode (ATM) protocol link between the gateway mobile switching center and the
serving mobile switching center and is a frame relay protocol link between the serving
30 mobile switching center and the base station.

10. The method of claim 1, further comprising, prior to step (a):
storing a visitor location register record for the roaming mobile unit at the gateway mobile switching center.

5 11. A method for maintaining call control at a gateway mobile switching center for a roaming mobile unit utilizing a packet network for bearer traffic transport, the method comprising:
(a) receiving an origination having dialed digits at a serving mobile switching center from the roaming mobile unit;
10 (b) providing to the gateway mobile switching center an identification of the roaming mobile unit, the dialed digits, and a packet address of a base station;
(c) determining a data link connection identifier for a protocol handler for voice at the gateway mobile switching center;
(d) providing the data link connection identifier to the serving mobile
15 switching center and to the base station, to create a packet link between the gateway mobile switching center and the base station; and
(e) transmitting an outgoing call leg from the gateway mobile switching center and providing a connection between the outgoing call leg and the packet link for communication with the roaming mobile unit utilizing the packet link between the
20 gateway mobile switching center and the base station.

12. The method of claim 11, wherein the data link connection identifier is included as a parameter within an ANSI-41 compatible message.

25 13. The method of claim 11, wherein step (b) further comprises:
transmitting a gateway origination request invoke containing the base station packet address, the mobile identification and the dialed digits, from the serving mobile switching center to the gateway mobile switching center.

30

14. The method of claim 11, wherein step (d) further comprises:
receiving at the serving mobile switching center a gateway origination
request return result containing the data link connection identifier from the gateway
mobile switching center.

5

15. The method of claim 11, wherein step (b) further comprises:
transmitting a gateway origination request invoke containing the base
station packet address, the mobile identification and the dialed digits, from the serving
mobile switching center, through a stand-alone home location register, to the gateway
mobile switching center.

10

16. The method of claim 11, wherein step (d) further comprises:
receiving at the serving mobile switching center, through a stand-alone
home location register, a gateway origination request return result containing the data
link connection identifier from the gateway mobile switching center.

15

17. The method of claim 11, wherein step (c) further comprises:
providing the base station packet address to the protocol handler for voice.

20

18. The method of claim 11, wherein the packet link is an asynchronous
transfer mode (ATM) protocol link.

19. The method of claim 11, wherein the packet link is an Internet protocol
(IP) link.

25

20. The method of claim 11, wherein the packet link is a frame relay protocol
link.

21. The method of claim 11, wherein the packet link is an asynchronous transfer mode (ATM) protocol link between the gateway mobile switching center and the serving mobile switching center and is a frame relay protocol link between the serving mobile switching center and the base station.

5 22. The method of claim 11, further comprising, prior to step (a):
storing a visitor location register record for the roaming mobile unit at the gateway mobile switching center.

10 23. A system for maintaining call control at a gateway mobile switching center for a roaming mobile unit utilizing a packet network for bearer traffic transport, the system comprising:

a serving mobile switching center, the serving mobile switching center operative to provide an alert to the roaming mobile unit;

15 a base station coupled to the serving mobile switching center for wireless communication with the roaming mobile unit, the base station operative to receive a connection link identifier from the serving mobile switching center; and

a gateway mobile switching center coupled to the serving mobile switching center, the gateway mobile switching center having a protocol handler for voice, the gateway mobile switching center operative, upon reception of an incoming call leg for the roaming mobile unit, to determine the data link connection identifier for the protocol handler for voice and to provide the data link connection identifier to the serving mobile switching center for transmission to the base station; the gateway switching center further operative to obtain from the serving mobile switching center a packet address of the base station for communication with the roaming mobile unit to create a packet link
20 between the gateway mobile switching center and the base station; and following the alert to the roaming mobile unit, when an answer has been received from the roaming mobile unit, the gateway mobile switching center operative to provide a connection between the roaming mobile unit and the incoming call leg utilizing the packet link between the
25 gateway mobile switching center and the base station.
30

24. The system of claim 23, wherein the data link connection identifier is included as a parameter within an ANSI-41 compatible message.

25. The system of claim 23, wherein the gateway mobile switching center is further operative to transmit a routing request invoke containing the data link connection identifier to the serving mobile switching center, and to receive a routing request return result containing the base station packet address from the serving mobile switching center.

10 26. The system of claim 23, further comprising:
a stand-alone home location register coupled to the serving mobile switching center and to the gateway mobile switching center.

15 27. The system of claim 26, wherein the gateway mobile switching center is further operative to transmit a location request invoke containing the data link connection identifier to the stand-alone home location register; the stand-alone home location register is operative to transmit a routing request invoke containing the data link connection identifier to the serving mobile switching center, and to receive a routing request return result containing the base station packet address and a data link connection
20 identifier result from the serving mobile switching center; and wherein the gateway mobile switching center is further operative to receive a location request return result containing the base station packet address, the data link connection identifier result and a visitor location register profile from the stand-alone home location register.

25 28. The system of claim 23, wherein the gateway mobile switching center further includes a processor, the processor configured to provide the base station packet address to the protocol handler for voice.

29. The system of claim 23, wherein the packet link is an asynchronous
30 transfer mode (ATM) protocol link.

30. The system of claim 23, wherein the packet link is an Internet protocol (IP) link.

31. The system of claim 23, wherein the packet link is a frame relay protocol link.

32. The system of claim 23, wherein the packet link is an asynchronous transfer mode (ATM) protocol link between the gateway mobile switching center and the serving mobile switching center and is a frame relay protocol link between the serving mobile switching center and the base station.

33. The system of claim 23, wherein the gateway mobile switching center stores a visitor location register record for the roaming mobile unit.

15

34. A system for maintaining call control at a gateway mobile switching center for a roaming mobile unit utilizing a packet network for bearer traffic transport, the system comprising:

a serving mobile switching center, the serving mobile switching center
5 operative to receive an origination having dialed digits from the roaming mobile unit;

a base station coupled to the serving mobile switching center for wireless communication with the roaming mobile unit, the base station operative to receive a connection link identifier from the serving mobile switching center; and

a gateway mobile switching center coupled to the serving mobile
10 switching center, the gateway mobile switching center having a protocol handler for voice, the gateway mobile switching center operative to receive from the serving mobile switching center an identification of the roaming mobile unit, the dialed digits, and a packet address of the base station, the gateway switching center further operative to determine the data link connection identifier for the protocol handler for voice and to
15 providing the data link connection identifier to the serving mobile switching center to create a packet link between the gateway mobile switching center and the base station; and the gateway mobile switching center further operative to transmit an outgoing call leg and to provide a connection between the outgoing call leg and the packet link for communication with the roaming mobile unit.

20

35. The system of claim 34, wherein the data link connection identifier is included as a parameter within an ANSI-41 compatible message.

36. The system of claim 34, wherein the serving mobile switching center is
25 further operative to transmit to the gateway mobile switching center a gateway origination request invoke containing the base station packet address, the mobile identification and the dialed digits.

37. The system of claim 34, wherein the gateway mobile switching center is
30 further operative to transmit to the serving mobile switching center a gateway origination request return result containing the data link connection identifier.

38. The system of claim 34, further comprising:
a stand-alone home location register coupled to the serving mobile
switching center and to the gateway mobile switching center.

5

39. The system of claim 38, wherein the serving mobile switching center is
further operative to transmit a gateway origination request invoke, containing the base
station packet address, the mobile identification and the dialed digits, through the stand-
alone home location register to the gateway mobile switching center; and wherein the
gateway mobile switching center is further operative to transmit a gateway origination
request return result, containing the data link connection identifier, through the stand-
alone home location register to the serving mobile switching center.

10

40. The system of claim 34, wherein the gateway mobile switching center
further includes a processor, the processor configured to provide the base station packet
address to the protocol handler for voice.

15

41. The system of claim 34, wherein the packet link is an asynchronous
transfer mode (ATM) protocol link.

20

42. The system of claim 34, wherein the packet link is an Internet protocol
(IP) link.

43. The system of claim 34, wherein the packet link is a frame relay protocol
link.

25

44. The system of claim 34, wherein the packet link is an asynchronous
transfer mode (ATM) protocol link between the gateway mobile switching center and the
serving mobile switching center and is a frame relay protocol link between the serving
mobile switching center and the base station.

30

45. The system of claim 34, wherein the gateway mobile switching center stores a visitor location register record for the roaming mobile unit.

5 46. An apparatus for maintaining call control at a gateway mobile switching center for a roaming mobile unit utilizing a packet network for bearer traffic transport, the roaming mobile unit having a wireless link to a base station, the base station coupled to a serving mobile switching center, the apparatus comprising:

10 a network interface for reception of an incoming call leg and for transmission of an outgoing call leg;

a protocol handler for voice;

a packet network protocol handler; and

15 a processor coupled to the network interface, to the protocol handler for voice, and to the packet network protocol handler, wherein the processor, when operative, is configured to determine a data link connection identifier for the protocol handler for voice and to provide the data link connection identifier to the serving mobile switching center; the processor further configured to receive a base station packet address from the serving mobile switching center and to provide the base station packet address to the protocol handler for voice to create a packet link between the packet network protocol
20 handler and the base station; the processor further configured to provide a connection between the packet link and the incoming call leg for communication with the roaming mobile unit and to provide a connection between the packet link and the outgoing call leg for communication with the roaming mobile unit.

25 47. The apparatus of claim 46, wherein the processor is further configured to include the data link connection identifier as a parameter within an ANSI-41 compatible message.

48. The apparatus of claim 46, wherein the processor is further configured to transmit a routing request invoke containing the data link connection identifier to the serving mobile switching center, and to receive a routing request return result containing the base station packet address from the serving mobile switching center.

5

49. The apparatus of claim 46, further comprising a memory coupled to the processor, wherein the processor is further configured to transmit a location request invoke containing the data link connection identifier to a stand-alone home location register; wherein the processor is further configured to receive from the stand-alone home location register a location request return result containing the base station packet address, a data link connection identifier result and a visitor location register profile, and wherein the processor is further configured to store the visitor location register profile in the memory.

10

15 50. The apparatus of claim 46, wherein the processor is further configured to receive a gateway origination request invoke containing the base station packet address, the mobile identification and dialed digits for the outgoing call leg.

51. The apparatus of claim 46, wherein the processor is further configured to transmit a gateway origination request return result containing the data link connection identifier.

20

52. The apparatus of claim 46, wherein the packet network protocol handler is a protocol handler for asynchronous transfer mode (ATM) and wherein the packet link is an ATM protocol link.

25

53. The apparatus of claim 46, wherein the packet network protocol handler is a protocol handler for Internet protocol (IP) and wherein the packet link is an IP link.

54. The apparatus of claim 46, wherein the packet network protocol handler is a protocol handler for frame relay and wherein the packet link is a frame relay protocol link.

5 55. The apparatus of claim 46, wherein the packet network protocol handler is a protocol handler for asynchronous transfer mode (ATM) and wherein a first portion of the packet link is an asynchronous transfer mode (ATM) protocol link between the gateway mobile switching center and the serving mobile switching center and a second portion of the packet link is a frame relay protocol link between the serving mobile
10 switching center and the base station.

56. The apparatus of claim 46, further comprising a memory coupled to the processor, wherein the memory stores a visitor location register record for the roaming
15 mobile unit.

**APPARATUS, METHOD AND SYSTEM FOR MAINTAINING
CALL CONTROL AT A GATEWAY MOBILE SWITCHING CENTER
UTILIZING A PACKET NETWORK**

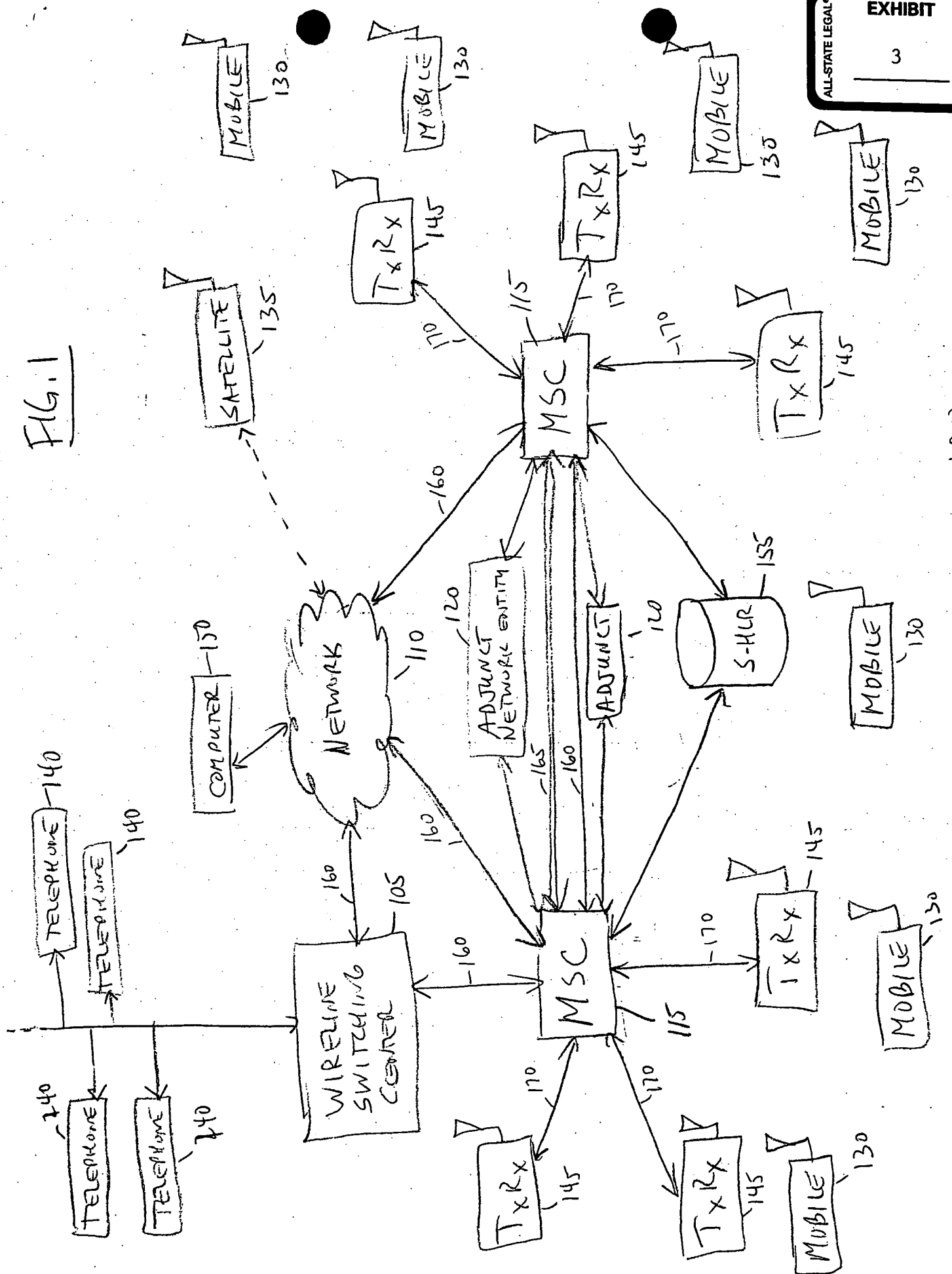
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Abstract of the Disclosure

The apparatus, method and system embodiments of the present invention provide for maintaining call control at a gateway mobile switching center (MSC), for roaming mobile units, utilizing a packet network or link, such as an ATM link. The preferred system embodiment includes a gateway MSC, a serving MSC, and a base station having a wireless link with the roaming mobile unit. The gateway MSC includes a protocol handler for voice (PHV). For any given incoming call for the roaming mobile unit or outgoing call from the roaming mobile unit, the gateway MSC designates a specific address (or channel) on the PHV, referred to as a data link connection identifier (DLCI), for use as an address for voice packets to be received from the roaming mobile unit via the base station and serving MSC, and the base station also provides a base station packet address to the gateway MSC, for use as an address for voice packets to be received from the gateway MSC (through the serving MSC) for the roaming mobile unit, thereby creating a full duplex packet link. The packet link serves as a voice path between the base station, the serving MSC, and gateway MSC, with all communication to and from the roaming mobile unit routed through the gateway MSC. The gateway MSC thereby maintains all call control for the roaming mobile unit for the implementation of advanced calling features, such as call waiting and three-way calling. In the preferred embodiment, the DLCI is included as a new parameter for ANSI-41 compatible messages. In addition, new ANSI-41 compatible messages are also utilized, a Gateway Origination Request containing the base station packet address and a Gateway Origination Request Return Result containing the new DLCI parameter.

25

FIG. 1



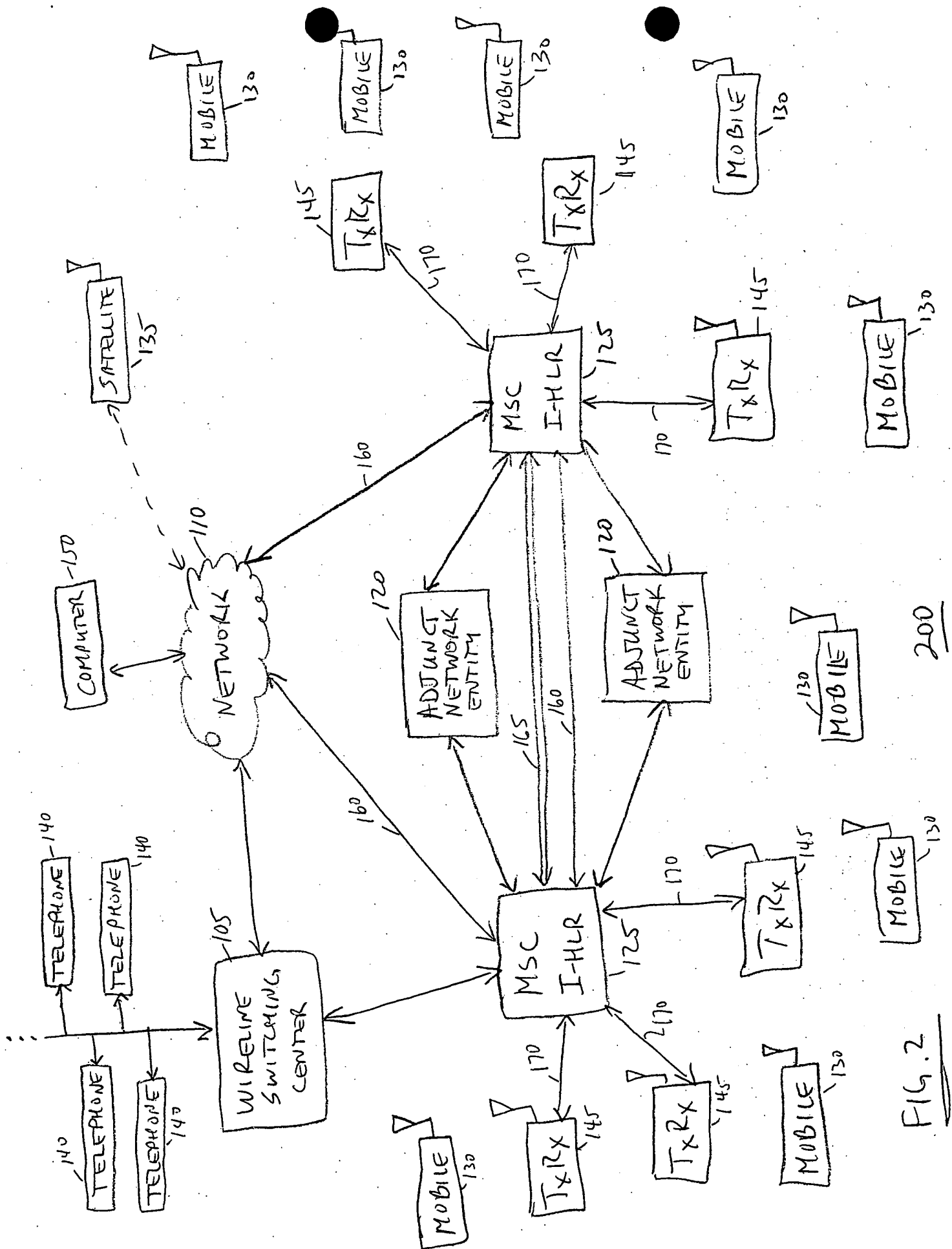


FIG. 2

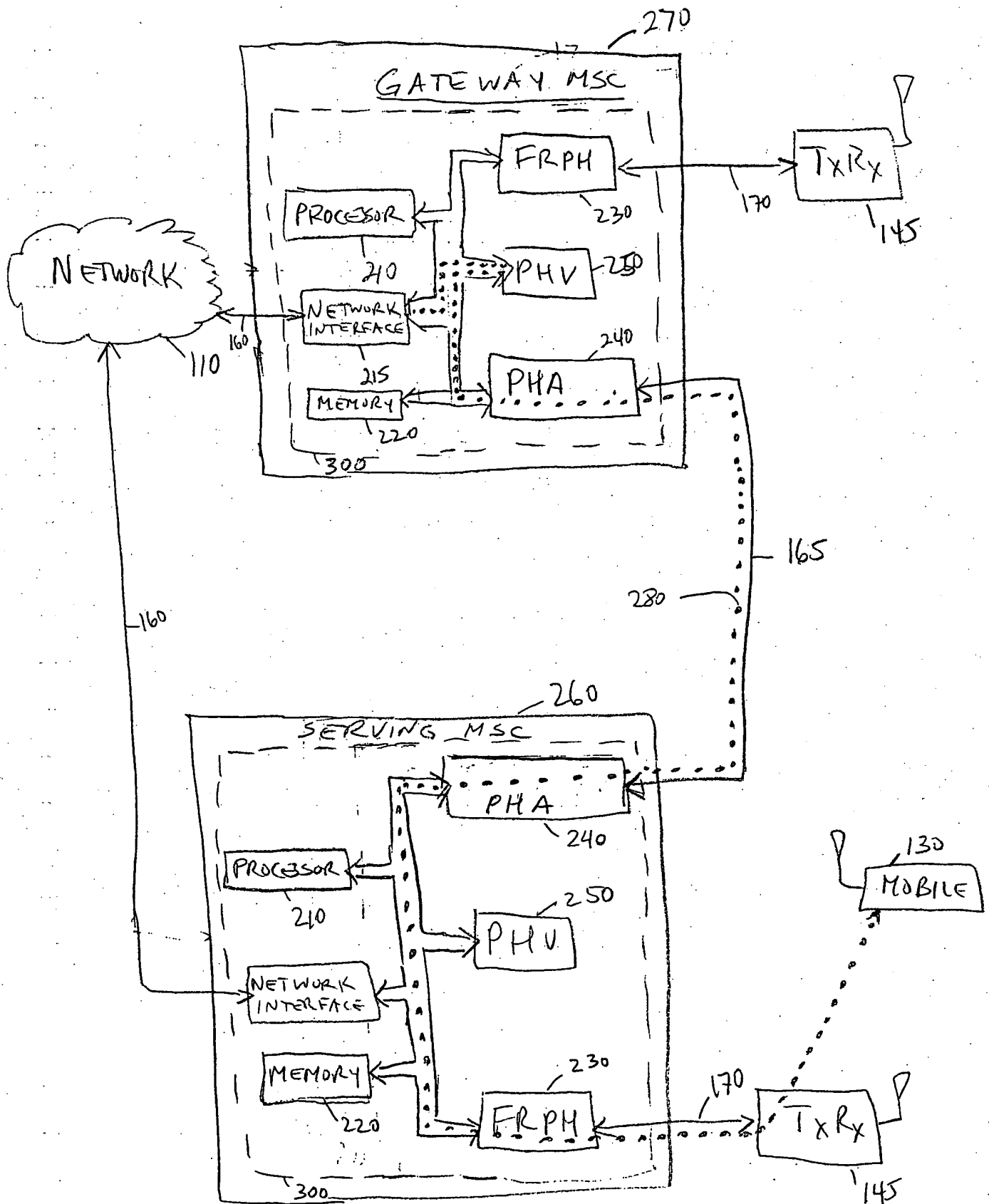


FIG. 3

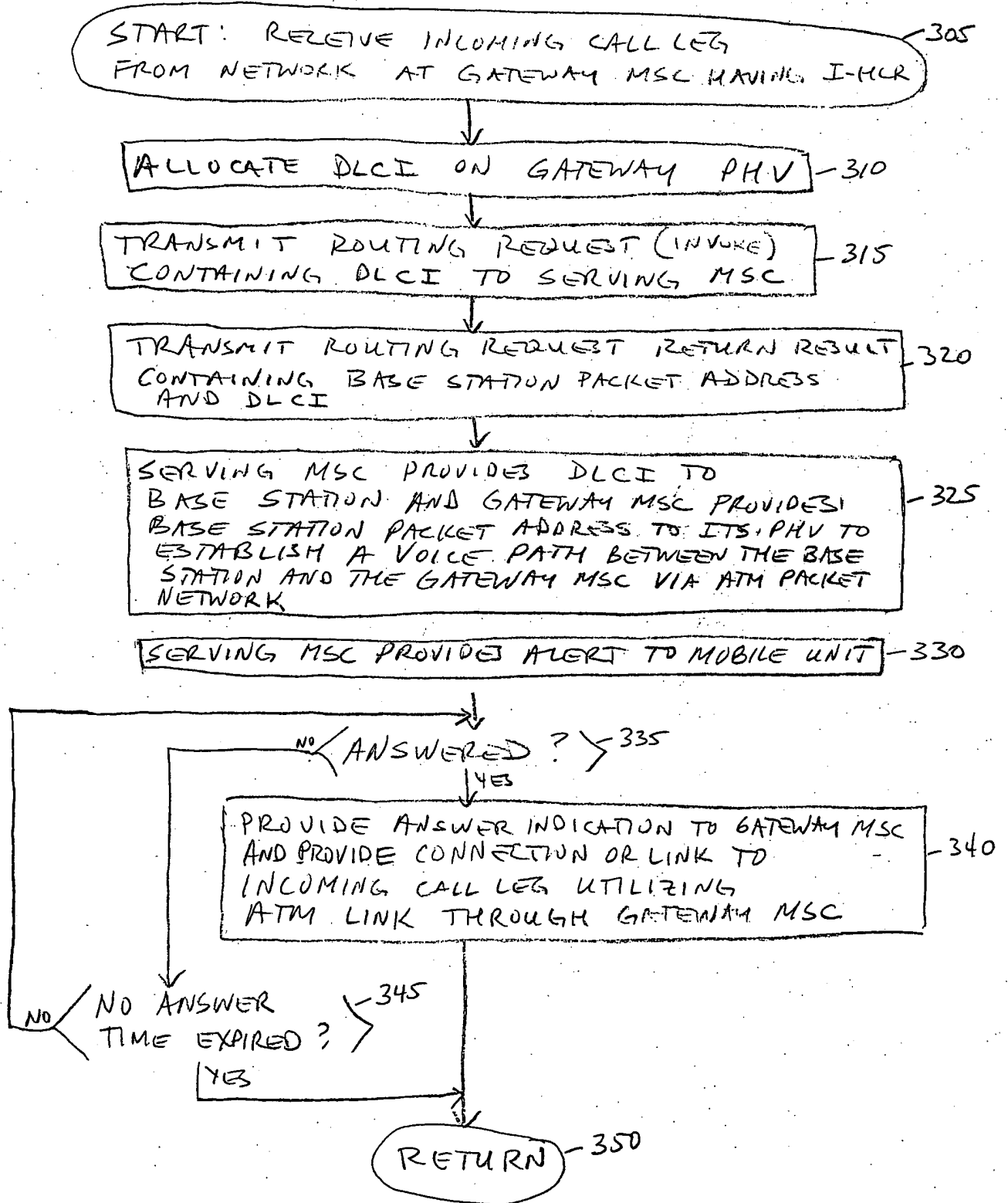


FIG. 4

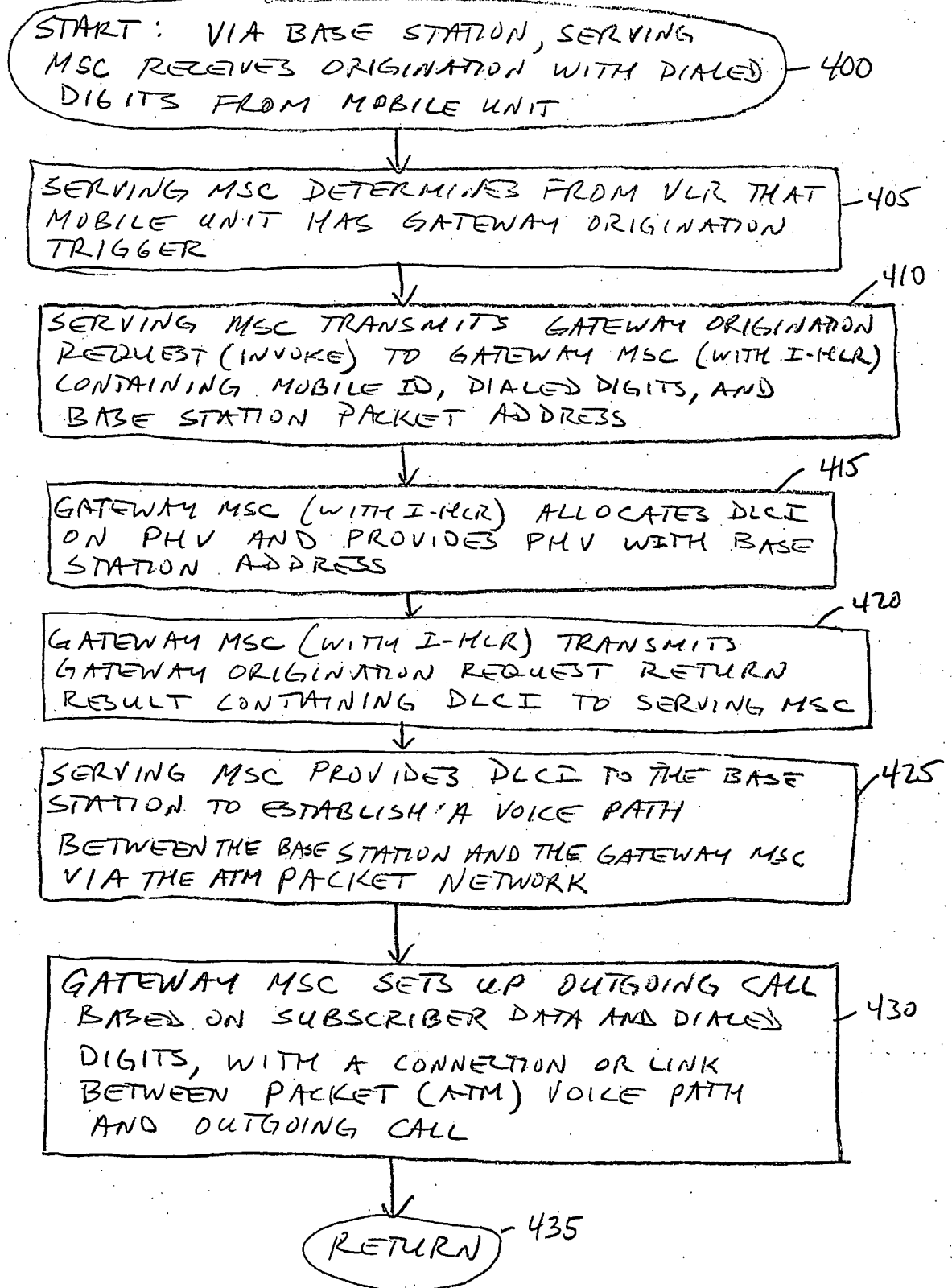


FIG. 5

FIG. 6

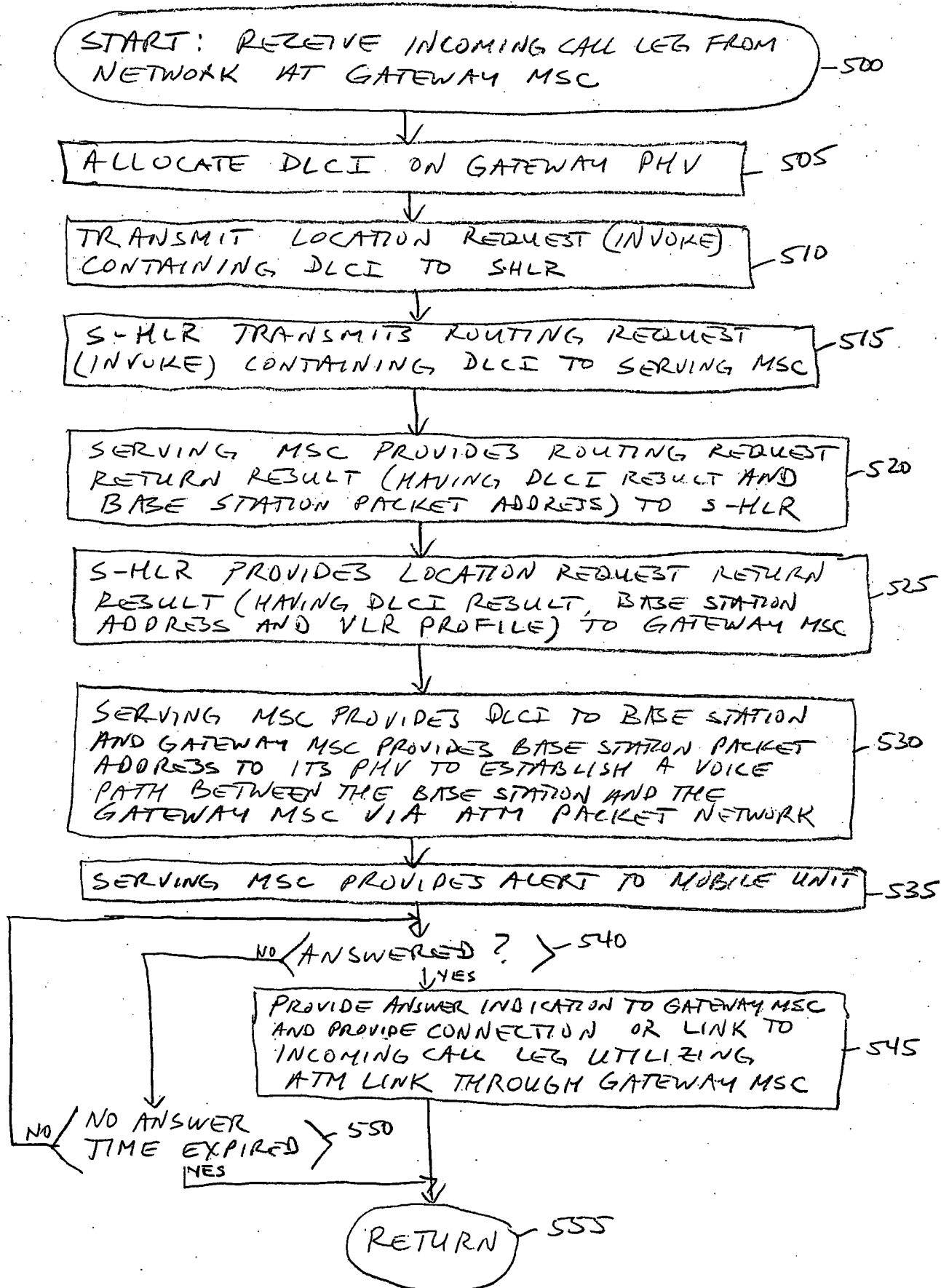
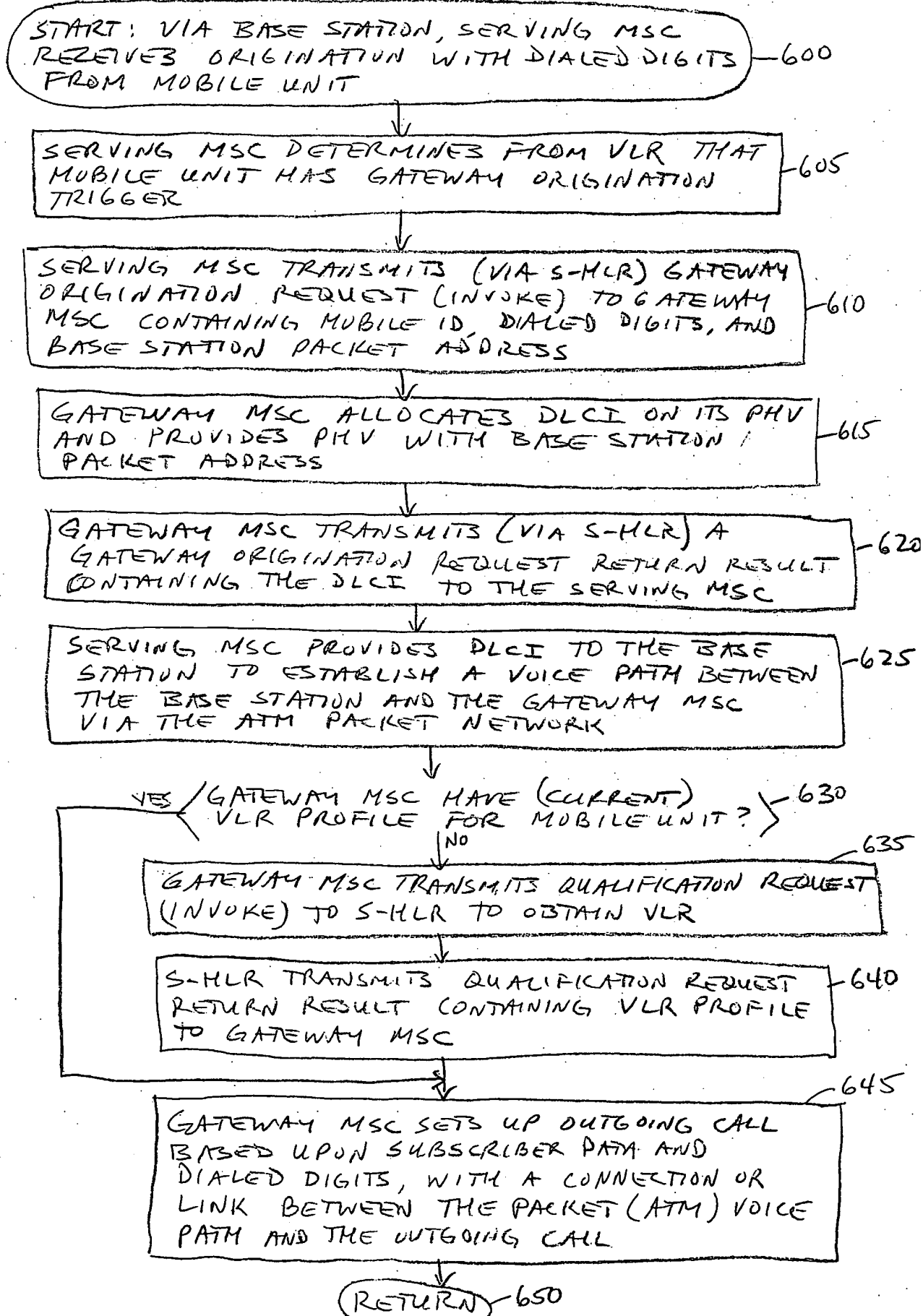
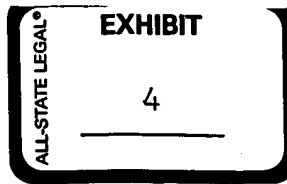


FIG. 7





Lucent Technologies, Inc.
Case No. Calabrese 10-3-7-16

IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

Declaration and Power of Attorney

As one of the below named inventors, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am an original, first and joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled **APPARATUS, METHOD AND SYSTEM FOR MAINTAINING CALL CONTROL AT A GATEWAY MOBILE SWITCHING CENTER UTILIZING A PACKET NETWORK** the specification of which is attached hereto.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by an amendment, if any, specifically referred to in this oath or declaration.

I acknowledge the duty to disclose all information known to me which is material to patentability as defined in Title 37, Code of Federal Regulations, 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

None

I hereby claim the benefit under Title 35, United States Code, 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, 112, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

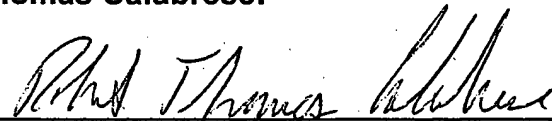
None

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

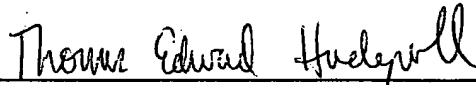
I hereby appoint the following attorney(s) with full power of substitution and revocation, to prosecute said application, to make alterations and amendments therein, to receive the patent, and to transact all business in the Patent and Trademark Office connected therewith:

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Jeffrey M. Weinick	(Reg. No. 36304)
Eli Weiss	(Reg. No. 17765)

I hereby appoint the attorney(s) on ATTACHMENT A as associate attorney(s) in the aforementioned application, with full power solely to prosecute said application, to make alterations and amendments therein, to receive the patent, and to transact all business in the Patent and Trademark Office connected with the prosecution of said application. No other powers are granted to such associate attorney(s) and such associate attorney(s) are specifically denied any power of substitution or revocation.

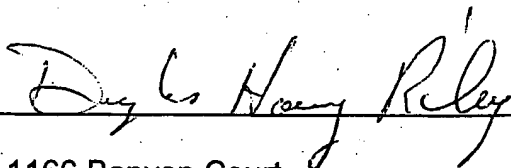
Robert Thomas Calabrese:Inventor's
signatureDate 4-25-00Residence: 1555 Pathway Drive
Naperville, Illinois 60565

Citizenship: United States of America

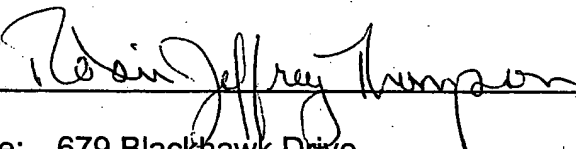
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Douglas Harvey Riley:Inventor's
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Naperville, Illinois 60540

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Batavia, Illinois 60510

Citizenship: United States of America

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Attorney Name(s): Nancy R. Gamburd Reg. No.: 38,147

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Nancy R. Gamburd
Gamburd & Associates, Ltd.
10 South LaSalle St., Suite 3300
Chicago, IL 60603-1002

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5

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CONVEYING PARTY(IES): (Last name first)

Calabrese, Robert Thomas Execution Date 04/25/2000
 Hudepohl, Thomas Edward 04/25/2000
 Riley, Douglas Harvey 04/25/2000
 Thompson, Robin Jeffrey 04/19/2000

Mark if additional names of conveying parties attached ☐

RECEIVING PARTY:

Name: Lucent Technologies Inc.
 Address: 600 Mountain Avenue
 City: Murray Hill
 State: New Jersey
 Zip Code: 07974-0636

Mark if additional names of receiving parties attached ☐

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5**CORRESPONDENT NAME AND ADDRESS:**

Nancy R. Gamburd
 Gamburd & Associates, Ltd.
 10 South LaSalle St., Suite 3300
 Chicago, Illinois 60603-1002
 (312) 372-2920 ext. 125

FEE AMOUNT:

Total Fee (37 CFR 3.41) \$40.00

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STATEMENT AND SIGNATURE

To the best of my knowledge and belief, the foregoing information is true and correct and any attached copy is a true copy of the original document. Charges to deposit account are authorized, as herein indicated.

Nancy R. Gamburd
 Name of Person Signing

[Signature]
 Signature

April 26, 2000
 Date

ASSIGNMENT AND AGREEMENT


For value received, we, **Robert Thomas Calabrese** of Naperville in the County of DuPage and State of Illinois, **Thomas Edward Hudepohl** of Geneva in the County of Kane and State of Illinois, **Douglas Harvey Riley** of Naperville in the County of DuPage and State of Illinois, and **Robin Jeffrey Thompson** of Batavia in the County of Kane and State of Illinois, hereby sell, assign and transfer to Lucent Technologies Inc., a corporation of the State of Delaware, having an office at 600 Mountain Avenue, Murray Hill, New Jersey 07974-0636, U.S.A., and its successors, assigns and legal representatives, the entire right, title and interest, for the United States of America, in and to certain inventions related to **APPARATUS, METHOD AND SYSTEM FOR MAINTAINING CALL CONTROL AT A GATEWAY MOBILE SWITCHING CENTER UTILIZING A PACKET NETWORK** described in an application for Letters Patent of the United States, executed by us of even date herewith, and all the rights and privileges in said application and under any and all Letters Patent that may be granted in the United States for said inventions; and we also concurrently hereby sell, assign and transfer to Lucent Technologies Inc. the entire right, title and interest in and to said inventions for all countries foreign to the United States, including all rights of priority arising from the application aforesaid, and all the rights and privileges under any and all forms of protection, including Letters Patent, that may be granted in said countries foreign to the United States for said inventions.

We authorize Lucent Technologies Inc. to make application for such protection in its own name and maintain such protection in any and all countries foreign to the United States, and to invoke and claim for any application for patent or other form of protection for said inventions, without further authorization from us, any and all benefits, including the right of priority provided by any and all treaties, conventions, or agreements.

We hereby consent that a copy of this assignment shall be deemed a full legal and formal equivalent of any document which may be required in any country in proof of the right of Lucent Technologies Inc. to apply for patent or other form of protection for said inventions and to claim the aforesaid benefit of the right of priority.

We request that any and all patents for said inventions be issued to Lucent Technologies Inc. in the United States and in all countries foreign to the United States, or to such nominees as Lucent Technologies Inc. may designate.

We agree that, when requested, we shall, without charge to Lucent Technologies Inc. but at its expense, sign all papers, and do all acts which may be necessary, desirable or convenient in connection with said applications, patents, or other forms of protection.


Robert Thomas Calabrese

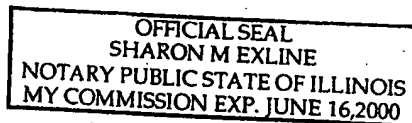
Date: April 25, 2000

United States of America)

State of Illinois) ss.:

County of DuPage)

On this 25th day of April, 2000, before me personally came **Robert Thomas Calabrese**, to me known to be the individual described in and who executed the foregoing instrument, and acknowledged execution of the same.




Notary Public

Thomas Edward Hudepohl
Thomas Edward Hudepohl

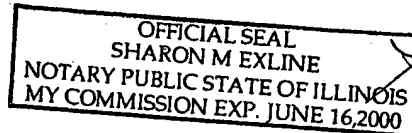
Date: 4/25/00

United States of America)

State of Illinois) ss.:

County of DuPage)

On this 25th day of April, 2000, before me personally came **Thomas Edward Hudepohl**, to me known to be the individual described in and who executed the foregoing instrument, and acknowledged execution of the same.



Sharon M. Exline
Notary Public

Douglas Harvey Riley
Douglas Harvey Riley

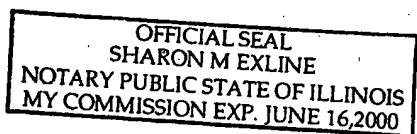
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United States of America)

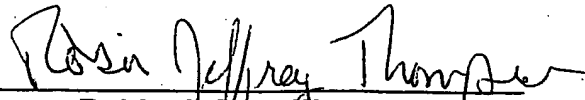
State of Illinois) ss.:

County of DuPage)

On this 25th day of April, 2000, before me personally came **Douglas Harvey Riley**, to me known to be the individual described in and who executed the foregoing instrument, and acknowledged execution of the same.



Sharon M. Exline
Notary Public


Robin Jeffrey Thompson

Date: April 19, 2000

United States of America)

State of Illinois) ss.:

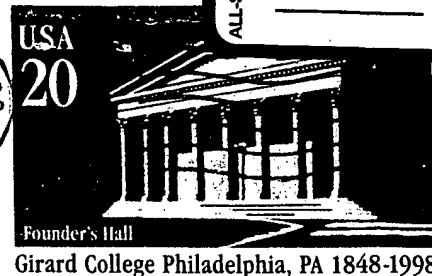
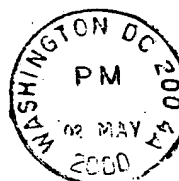
County of DuPage)

On this 19th day of April, 2000, before me personally came **Robin Jeffrey Thompson**, to me known to be the individual described in and who executed the foregoing instrument, and acknowledged execution of the same.




Notary Public

Lucent Technologies Inc.
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Nancy R. Gamburd
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10 S. LaSalle St., Suite 3300
Chicago IL 60603-1002

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Specification, Claims and Abstract (30 pages)
Informal Drawings (7 Sheets)
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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF : Calabrese, et al.
FOR : APPARATUS, METHOD AND SYSTEM
FOR MAINTAINING CALL CONTROL
AT A GATEWAY MOBILE SWITCHING
CENTER UTILIZING A PACKET
NETWORK
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**DECLARATION OF ATTORNEY NANCY R. GAMBURD
IN SUPPORT OF PETITION TO ESTABLISH PRIOR RECEIPT
IN THE PATENT AND TRADEMARK OFFICE OF ITEM APPARENTLY
CONSIDERED OMITTED BY THE PATENT AND TRADEMARK OFFICE**

Commissioner for Patents
P.O. Box 1450
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Dear Commissioner:

I, Nancy R. Gamburd, hereby declare:

1. I am a registered patent attorney (Reg. No. 38,147) and a member of the law firm of Dykema Gossett Rooks Pitts, PLLC, 10 South Wacker Drive, Suite 2300, Chicago, IL 60606.

2. During 2000, I was an attorney and principal at the law firm of Gamburd & Associates, Ltd., 10 South LaSalle Street, Suite 3300, Chicago, IL 60603-1002.

3. On April 26, 2000, I filed the above-identified patent application via Express Mail No. EK429074425US. This Express Mail package included a transmittal cover letter with the fee calculation and deposit account authorization (2 copies); a specification, claims, and abstract; a set of informal drawings; an executed declaration and power of attorney; an executed assignment and cover sheet; and a return postcard.

4. At the time the above-identified patent application was filed, I always used a checklist to prepare each Lucent Technologies patent application for filing with the Patent and Trademark Office. The checklist included: 1) application (i.e., specification, claims, and abstract), 2) drawings, 3) transmittal (two copies), 4) declaration, 5) assignment, 6) assignment cover sheet, and 7) return postcard. It was also my standard practice to separately photocopy each patent application being filed and to collate the copies into three groups: 1) a copy to be filed with the Patent and Trademark Office in an Express Mail package, 2) a copy to be reported to the client, and 3) a copy for a historical file. Additionally, it was my standard practice to double check each copy a second time against the checklist before sealing the Express Mail package to the Patent and Trademark Office. When I was filing more than one application, once I had completed this process for the first application, I repeated this process for the second application. Furthermore, as I did not use an administrative assistant, it was my standard practice to personally photocopy each application, personally stuff the copy of the application to be filed with the Patent and Trademark Office in the Express Mail package, and personally deposit the Express Mail package with the U.S. Post Office.

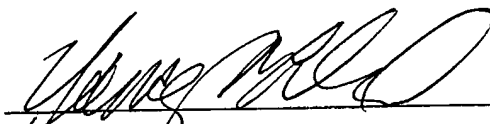
5. On April 26, 2000, I followed my standard procedures described above when filing the above-identified patent application.

6. Shortly after May 2, 2000, I received the return postcard from the Patent and Trademark Office confirming receipt of the Express Mail package containing the originally-filed specification, claims, and abstract. The return postcard included a Patent and Trademark Office label indicating that serial no. 09/558,613 was assigned to the above-identified patent application and that April 26, 2000 was the filing date. The return postcard was postmarked May 2, 2000. The "specification, claims, and abstract (30 pages)" item on the return postcard was not annotated, indicating that the originally-filed 30-page specification, claims, and abstract was received by the Patent and Trademark Office.


7. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

June 10, 2004

Date



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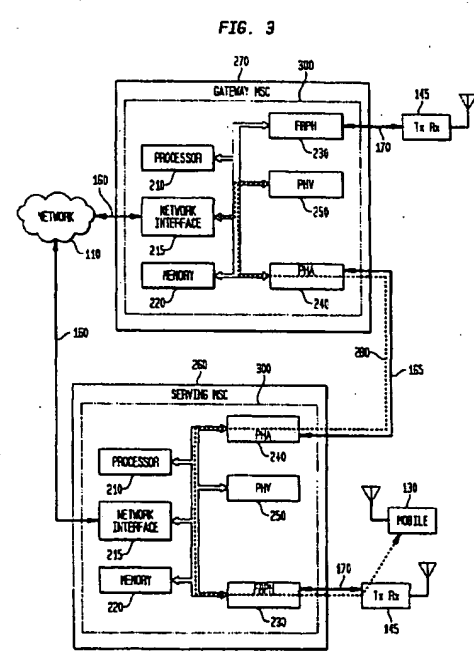
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(54) **Apparatus, method and system for maintaining call control at a gateway mobile switching center utilizing a packet network**

(57) The apparatus, method and system embodiments of the present invention provide for maintaining call control at a gateway mobile switching center (MSC), for roaming mobile units, utilizing a packet network or link, such as an ATM link. The preferred system embodiment includes a gateway MSC, a serving MSC, and a base station having a wireless link with the roaming mobile unit. The gateway MSC includes a protocol handler for voice (PHV). For any given incoming call for the roaming mobile unit or outgoing call from the roaming mobile unit, the gateway MSC designates a specific address (or channel) on the PHV, referred to as a data link connection identifier (DLCI), for use as an address for voice packets to be received from the roaming mobile unit via the base station and serving MSC, and the base station also provides a base station packet address to the gateway MSC, for use as an address for voice packets to be received from the gateway MSC (through the serving MSC) for the roaming mobile unit, thereby creating a full duplex packet link. The packet link serves as a voice path between the base station, the serving MSC, and gateway MSC, with all communication to and from the roaming mobile unit routed through the gateway MSC. The gateway MSC thereby maintains all call control for the roaming mobile unit for the implementation of advanced calling features, such as call waiting and three-way calling. In the preferred embodiment, the DLCI is included as a new parameter for ANSI-41 compatible messages. In addition, new ANSI-41 compatible

messages are also utilized, a Gateway Origination Request containing the base station packet address and a Gateway Origination Request Return Result containing the new DLCI parameter.



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Description

Field of the Invention

[0001] The present invention relates, in general, to mobile telecommunication systems and, more specifically, to an apparatus, method and system for maintaining call control at a gateway mobile switching center utilizing a packet network.

Background of the Invention

[0002] In recent years, there has been an exponential growth in the use and provision of wireless telephony services, such as cellular and PCS services. With such growth, a mobile unit such as a cellular telephone may traverse different geographic regions, obtaining telecommunication services from a wide variety of service providers utilizing a wide variety of equipment.

[0003] In addition, with the advent of increasingly sophisticated mobile telecommunication services, there is a growing need to maintain control over calls to and from mobile units, such as cellular telephones, at a central location. Such central control is especially important for the implementation of advanced calling features such as call waiting, call forwarding on busy, and three-way calling. Such central control should also utilize advanced networking capability, such as use of packet networks such as asynchronous transfer mode ("ATM") packet networks or Internet protocol ("IP") packet networks.

[0004] As a consequence, a need remains for an apparatus, method and system to provide for maintaining call control, for both incoming and outgoing calls, at a designated mobile switching center, utilizing a packet network. The apparatus, method and system should also provide the capability to implement advanced calling features in a mobile environment, such as call waiting or three-way calling, without utilizing additional circuit switched network links such as trunk lines. The apparatus, method and system should also provide for increased network efficiency, increased ease of implementation of advanced calling features, conservation of circuit switched network resources, and capability of implementation in utilizing existing network equipment.

Summary of the Invention

[0005] The apparatus, method and system embodiments of the present invention provide for maintaining call control at a gateway mobile switching center (MSC), for roaming mobile units, utilizing a packet network or link, such as an ATM link, for bearer traffic transport. The preferred system embodiment includes a gateway MSC, a serving MSC, and a base station having a wireless link with the roaming mobile unit. All incoming calls to the roaming mobile unit and outgoing calls from the roaming mobile unit are transmitted (or routed) through

the gateway MSC, over a packet link created between the gateway MSC, the serving MSC, and the base station. The gateway MSC thereby maintains all call control for the roaming mobile unit for the implementation of advanced calling features, such as call waiting, call forwarding on busy, and three-way calling.

[0006] The gateway MSC includes a protocol handler for voice (PHV). For any given incoming call for the roaming mobile unit or outgoing call from the roaming mobile unit, the gateway MSC designates a specific address (or channel) on the PHV, referred to as a data link connection identifier (DLCI), for use as an address for voice packets to be received from the roaming mobile unit via the base station and serving MSC; the base station also provides a base station packet address to the gateway MSC, for use as an address for voice packets to be received from the gateway MSC (through the serving MSC) for the roaming mobile unit, thereby creating a full duplex packet link. The packet link provides or serves as a voice path between the base station, the serving MSC, and gateway MSC, with all communication to and from the roaming mobile unit routed through the gateway MSC. The gateway MSC thereby maintains all call control for the roaming mobile unit for the implementation of advanced calling features, such as call waiting and three-way calling.

[0007] In the preferred embodiment, the DLCI is included as a new parameter for ANSI-41 compatible messages, such as within Location Requests and Routing Requests. In addition, new ANSI-41 compatible messages are also utilized, a Gateway Origination Request containing the base station packet address and a Gateway Origination Request Return Result containing the new DLCI parameter.

[0008] Numerous other advantages and features of the present invention will become readily apparent from the following detailed description of the invention and the embodiments thereof, from the claims and from the accompanying drawings.

Brief Description of the Drawings

[0009]

Fig. 1 is a block diagram illustrating a first system embodiment to maintain call control at a gateway mobile switching center utilizing a packet network in accordance with the present invention.

Fig. 2 is a block diagram illustrating a second system embodiment to maintain call control at a gateway mobile switching center utilizing a packet network in accordance with the present invention.

Fig. 3 is a block diagram illustrating an apparatus embodiment to maintain call control at a gateway mobile switching center utilizing a packet network in accordance with the present invention.

Fig. 4 is a flow diagram illustrating a method embodiment to maintain call control at a gateway mo-

mobile switching center having an integrated HLR, utilizing a packet network, for incoming calls in accordance with the present invention.

Fig. 5 is a flow diagram illustrating a method embodiment to maintain call control at a gateway mobile switching center having an integrated HLR, utilizing a packet network, for outgoing calls in accordance with the present invention.

Fig. 6 is a flow diagram illustrating a method embodiment to maintain call control at a gateway mobile switching center having a stand-alone HLR, utilizing a packet network, for incoming calls in accordance with the present invention.

Fig. 7 is a flow diagram illustrating a method embodiment to maintain call control at a gateway mobile switching center having a stand-alone HLR, utilizing a packet network, for outgoing calls in accordance with the present invention.

Detailed Description of the Invention

[0010] While the present invention is susceptible of embodiment in many different forms, there are shown in the drawings and will be described herein in detail specific embodiments thereof, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the specific embodiments illustrated.

[0011] As mentioned above, a need remains to provide for maintaining call control at a designated mobile switching center, utilizing a packet network. In accordance with the present invention, an apparatus, method and system are provided which maintain call control, for both incoming and outgoing calls, at such a designated mobile switching center ("MSC"), referred to herein as a "gateway" MSC, utilizing a packet network. In the preferred embodiment, an ATM packet network is utilized to provide such call control at the gateway MSC, and to provide a packet link for bearer traffic between the gateway MSC and any serving MSC. As a consequence, in accordance with the present invention, advanced calling features, such as call waiting or three-way calling, may be implemented in a mobile environment without utilizing additional circuit switched network links such as trunk lines. The various embodiments of the present invention therefore provide for increased network efficiency, increased ease of implementation of advanced calling features, conservation of circuit switched network resources, and capability of implementation in utilizing existing network equipment.

[0012] Fig. 1 is a block diagram illustrating a first system embodiment 100 to maintain call control at a gateway MSC utilizing a packet network in accordance with the present invention. Fig. 2 is a block diagram illustrating a second system embodiment 200 to maintain call control at a gateway mobile switching center utilizing a packet network in accordance with the present inven-

tion. The systems 100 includes one or more mobile switching centers ("MSCs") 115 (in Fig. 1) and 125 (in Fig. 2) and one or more wireline switching centers 105, which may also be connected via trunk and signaling lines 160 to each other and to a broader network 110, such as a public switched telephone network ("PSTN") or an integrated services digital network ("ISDN"), providing multiple telecommunication connections to other locations, such as providing a link to a computer 150 (or other internet connection) and a link to satellite 135, such as a telecommunication satellite.

[0013] As discussed in greater detail below, in accordance with the present invention, any of the MSCs 115 and 125 may function as a gateway MSC. Incoming calls to a mobile unit 130 will be routed and controlled by the gateway MSC. Outgoing calls which originate at a different, "serving" MSC (115 or 125) will be routed over an ATM link to the gateway MSC, to provide call control and advanced calling features, such as call waiting, call forwarding and three-way calling.

[0014] Referring to Figs. 1 and 2, the systems 100 and 200 may also include one or more intelligent network devices referred to as adjunct network entities 120, such as a service control point ("SCP"), a service node ("SN"), an intelligent peripheral ("IP"). Another type of adjunct network entity implements database functionality, and is generally referred to as a home location register ("HLR"). As illustrated in Fig. 1, the HLR functionality is implemented utilizing stand-alone home location registers ("S-HLRs") 155. In contrast, in Fig. 2, the HLR functionality is implemented in an equivalent form, utilizing integrated home location registers ("I-HLRs"), which are integrated within the MSCs 125. The adjunct network entities 120 are preferably connected or coupled to a MSC 115 (or 125), utilizing either a packet-based or a circuit switched connection. The system 100 or 200 may also have a network (such as internet) connection to a computer 150 (or other network communication device). In the preferred embodiment, each MSC 115 or 125 also includes or is associated with a database referred to as a visitor location register ("VLR").

[0015] As indicated above, for the system 200 embodiment, HLR functionality is integrated into the mobile switching centers, as MSCs 125 (with I-HLRs). As discussed in greater detail below, the system 200 with I-HLR functionality within the MSC 125 may utilize different messaging types for implementation of the present invention, and in all other respects is identical to the system 100 illustrated in Fig. 1.

[0016] In accordance with the present invention, the MSCs 115 or 125 are also coupled to each other through a packet-based channel, line or network, such as ATM link 165, which may be any type of medium, such as a fiber optic, cable or other physical medium for providing an ATM link. In the preferred embodiment, the MSCs 115 and 125 are also linked to base stations (or other wireless transceivers) 145, preferably via currently employed frame relay links 170 or other packet based sys-

tems (such as ATM) (when backwards compatibility is not required). The base stations 145, in turn, provide a wireless communications link from the MSCs 115 or 125 to the various mobile units 130, such as cellular, PCS or other wireless telephones, personal digital assistants or other wireless devices, within particular geographic regions, for voice and data communications. The wireline switching center 105 is also generally connected to a plurality of telephones 140 or other customer premise equipment, also for voice and data communications. In addition, while the wireline (105) and mobile switching centers 115 and 125 are usually physically separated due to regulatory and other historical reasons, these switching centers may also be combined into one or more switching centers having both wireline and wireless functionalities.

[0017] Continuing to refer to Figs. 1 and 2, any of the MSCs 115 or 125, for any given mobile unit 130, may be operating as a gateway MSC in accordance with the present invention. More specifically, each mobile unit 130 is generally assigned to a particular MSC (115 or 125), referred to as its home MSC, with information pertaining to that mobile unit 130 stored in a corresponding HLR, such as within an S-HLR 155 associated with the home MSC 115 or within an I-HLR of a home MSC 125. Such information, for example, may include calling features and services available to that particular mobile unit 130. Through the various corresponding base stations 145 or other wireless transceivers, each MSC 115 or 125 generally provides mobile telecommunication and other services to mobile units 130 within a particular geographic region or range. As each mobile unit 130 may roam throughout or traverse a geographic region, it may move out of the range of a particular MSC (115 or 125) and its corresponding base stations 145, and into the range of another MSC (115 or 125) with its corresponding base stations 145, with a corresponding hand off of an ongoing communication session between the MSCs (115 or 125) (via base stations 145). (Additional hand offs may also occur between base stations 145 connected to the same MSC 115 or 125).

[0018] As a consequence, when an MSC 115 or 125 is providing telecommunication and other services to a mobile unit 130 that has roamed into its range or geographic region (*i.e.*, within range of any of its corresponding base stations 145), that MSC (115 or 125) is referred to as a serving MSC. A roaming mobile unit 130 may both initiate outgoing calls and receive incoming calls while within the range of any given serving MSC. Such a serving MSC typically stores and maintains information pertaining to such roaming mobile units within the visitor database (VLR) of its associated HLR, such as a S-HLR 155 associated with an MSC 115 or an I-HLR of an MSC 125.

[0019] In accordance with the present invention, for any given mobile unit 130, a home MSC 115 or 125 will generally operate as a gateway MSC while one of its assigned mobile units 130 is in another, different geo-

graphic area and is being served by a serving MSC. Any MSC 115 or 125 may function as a gateway MSC for a particular mobile unit 130, provided that it has a complete database for that mobile unit 130 and is able (or assigned) to route incoming calls for that mobile unit 130. As a consequence, any given MSC 115 or 125 may be both a gateway MSC and a serving MSC during the same period of time: an MSC 115 or 125 operates as a gateway MSC when providing services to its own assigned (or home) mobile units 130 which have roamed into another region, as discussed in greater detail below; and an MSC 115 or 125 operates as a serving MSC when providing services to any mobile unit 130 within its region or range (both visiting and home mobile units 130).

[0020] The gateway functionality referred to above, in accordance with the present invention, allows a gateway (home or anchor) MSC 115 or 125 to retain control over all incoming and outgoing calls to and from its assigned (or home) mobile units 130. This gateway functionality, therefore, allows the gateway MSC 115 or 125 to implement advanced calling features, such as call waiting or three-way calling, regardless of the current location of any of its mobile units 130. As discussed in greater detail below, such control is maintained by creating (or routing) a voice path between a serving MSC and a gateway MSC through a packet network, such as through an ATM network or link 165. During call set up, a gateway MSC reserves or designates an address, utilizing a new parameter referred to as a data link connection identifier ("DLCI"), for use for all voice and data packets for that call (*i.e.*, traffic or bearer traffic) to be transmitted to the gateway MSC from a serving MSC over the packet network. The new DLCI parameter is preferably requested and transmitted in new message forms, respectively referred to as a gateway origination request and gateway origination return result. In the preferred embodiment, the gateway origination request and return result messages are extensions compatible with the ANSI-41 protocol or standard promulgated by the American National Standards Institute.

[0021] For example, for an outgoing call from a mobile unit 130, the serving MSC (115 or 125) (via its S-HLR or I-HLR) obtains a DLCI from the gateway MSC (115 or 125). The outgoing call is then created or routed through the gateway MSC (115 or 125), by transmitting voice packets having the DLCI as an address or header from the serving MSC to the gateway MSC via a packet network or link, such as via ATM link 165. During this time, the gateway MSC (115 or 125) may also receive an incoming call for the particular mobile unit 130; due to its control over the outgoing call, the gateway MSC may provide an alert to the mobile unit 130 such as a call waiting signal, may provide a call forwarding on busy, or may create a three-way (bargain-in) communication session. Call flows and messaging for such call control and routing are discussed in greater detail below with reference to Figs. 4 through 7.

[0022] Fig. 3 is a block diagram illustrating an apparatus embodiment 300 to maintain call control at a gateway MSC utilizing a packet network in accordance with the present invention. In the preferred embodiment, the apparatus 300 is included within an MSC 115 or 125, such as within the gateway MSC 270 or serving MSC 260 illustrated in Fig. 3. The apparatus 300 includes a processor 210, a network interface 215, a memory 220, and protocol handlers for various packet-based protocols, depending upon the system 100 or 200 implementation, such as a frame relay protocol handler ("FRPH") 230, a protocol handler for voice ("PHV") 250, and a protocol handler for ATM ("PHA") 240.

[0023] Referring to Fig. 3, the network interface 215 is utilized to receive and transmit voice information and other data, control messages, call set up messages, and other pertinent information, to and from the network 110, and is typically designed to interface with a circuit switched network. The memory 220 may be a magnetic hard drive, an optical storage device, an integrated circuit, or any other type of data storage apparatus. The memory 220 is used to store information pertaining to program instructions or configurations (discussed below), call management and call routing information, and may include database (HLR and VLR) functionality, particularly when an HLR is implemented as an I-HLR within an MSC 125. Alternatively, in performing such HLR and VLR information storage and functionality, the memory 220 may be included within a stand-alone database, such as an S-HLR 155.

[0024] Continuing to refer to Fig. 3, the processor 210 may include a single integrated circuit ("IC"), or may include a plurality of integrated circuits or other components connected, arranged or grouped together, such as microprocessors, digital signal processors ("DSPs"), application specific integrated circuits ("ASICs"), field programmable gate arrays ("FPGAs"), associated memory (such as RAM and ROM), and other ICs and components. As a consequence, as used herein, the term processor should be understood to equivalently mean and include a single processor, or arrangement of processors, microprocessors, controllers, or some other grouping of integrated circuits which perform the functions discussed above and also discussed in detail below with reference to Figs. 4 through 7, with associated memory, such as microprocessor memory or additional RAM, DRAM, SRAM, MRAM, ROM, EPROM or E²PROM. The processor 210 with its associated memory may be configured to perform the methodology of the invention, as discussed above with reference to Figs. 1 and 2 and as discussed below with reference to Figs. 4 through 7. For example, the methodology may be programmed and stored, in the processor 210 with its associated memory (and/or memory 220) and other equivalent components, as a set of program instructions (or equivalent configuration or other program) for subsequent execution when the processor 210 is operative (*i.e.*, powered on and functioning). (Equivalently, when

the processor 210 with its associated memory and other equivalent components are implemented in whole or part as FPGAs and/or ASICs, the FPGAs or ASICs also may be designed, configured or hard-wired to implement the methodology of the invention).

[0025] Continuing to refer to Fig. 3, in the preferred embodiment, the apparatus 300 includes a frame relay protocol handler (FRPH) 230 as an interface to the base stations 145 through a frame relay link 170. (In lieu of FRPH 230, other equivalent, packet based protocol handlers may also be used, depending upon the available links or channels to the various base stations 145, such as ATM links). Also in the preferred embodiment, voice information from mobile units 130 is subrate sampled by the base stations 145 at 8K bits/second; the subrate samples are transmitted to the MSC 115 or 125 (such as serving MSC 260) via frame relay link 170, and are converted to full rate (64K bits/second) utilizing the protocol handler for voice (PHV) 250. The apparatus 300 further includes a protocol handler for ATM (PHA) 240, to maintain call control functionality within the gateway MSC 270, when the various MSCs 115 and 125, such as gateway MSC 270 and serving MSC 260, are connected via an ATM link 165. Alternatively, in the event the MSCs 115 and 125 are connected through a different type of packet link, a corresponding protocol handler should be utilized in lieu of PHA 240, such as an Internet protocol (IP) handler.

[0026] To illustrate the ATM or other packet link between the serving MSC 260 and the gateway MSC 270, a full duplex voice path 280 (dotted line) between the MSCs is illustrated in Fig. 3. During call set up, the gateway MSC 270 reserves a channel of its PHV 250 and provides the serving MSC 260 (via HLR functionality) with a specific address for the reserved channel of the PHV 250, referred to as a data link connection identifier ("DLCI"). The serving MSC 260, in turn, provides the DLCI to the base station 145 serving the mobile unit 130. Beginning with the mobile unit 130, a wireless link is created to the base station 145 which, in turn, transmits subrate voice packets to the FRPH 230 (in serving MSC 260) via frame relay link 170, with addressing designating the DLCI of the PHV 250 (in the gateway MSC 270). These frame relay voice packets are transferred to the PHA 240 within the serving MSC 260, which provides the appropriate ATM formatting and addressing for the PHA 240 in the gateway MSC 270. The ATM packets are transmitted over the ATM link 165 to the PHA 240 of the gateway MSC 270; the ATM layer is stripped, and the frame relay packets are delivered to the DLCI address of the PHV 250 (of the gateway MSC 270). From the PHV 250, the packets are converted to full rate (*e.g.*, 64K/second for PCM), and transferred to the network interface 215 for transmission via the network 110.

[0027] Similarly, for incoming voice from the network, the PHV 250 of the gateway MSC 270 is provided with an address for the base station 145, with a different address for each call handled by the base station 145.

Those voice packets or frames are provided with ATM formatting and addressing, for transmission over ATM link 165 to the serving MSC 260 and (via frame relay) to the serving base station 145 for wireless transmission to the mobile unit 130.

[0028] As mentioned above, as a mobile unit 130 traverses a given geographic region, it may move in or out of range of base stations 145 associated with a given MSC 115 or 125. As it does so, the mobile unit 130 typically registers with the MSC 115 or 125 providing service in the newly entered geographic region. During such registration, a serving MSC 125 receives database information from the gateway (or home) MSC 125 with I-HLR, and generates a corresponding VLR for the particular mobile unit, such as call handling instructions and triggers. For MSCs 115 with stand-alone HLRs (S-HLRs 155), the serving MSC 115 typically transmits a registration notification (ANSI-41 RegistrationNotification Invoke) to the S-HLR 155, and in response (ANSI-41 RegistrationNotification Return Result) receives this database information and also generates a corresponding VLR for the particular mobile unit, such as call handling instructions and triggers. In the preferred embodiment, a second VLR is also generated at the gateway MSC 115 or 125 by the S-HLR or I-HLR. More specifically, following transmission of the registration notification response to the serving MSC 115, the S-HLR 155 also transmits a qualification directive to the gateway MSC 115, which directive includes the VLR database information for the roaming mobile unit 130. Alternatively, a static VLR may be maintained at the gateway MSC 115, and updated by the S-HLR only when VLR impacting changes are made, such as to change an end user feature code or an administrative data entry. Following such a transmission of either the VLR database information or changes to the VLR database, the gateway MSC 115 transmits a qualification directive return result as an acknowledgement to the S-HLR. This second copy of the VLR at the gateway MSC 115 or 125 enables the gateway MSC to determine whether the roaming mobile unit 130 will have ATM voice path capability for incoming and outgoing calls. This second copy of the VLR at the gateway MSC 115 or 125 also provides a significant contrast with the prior art in which only one copy of a VLR is maintained and only at a serving MSC.

[0029] As mentioned above, and as discussed in greater detail below, a new DLCI parameter and a new message type with a corresponding response are utilized in the preferred embodiment. The DLCI parameter may be included as a new parameter within a wide variety of ANSI-41 compatible messages types, such as location requests (with corresponding location request return results) and routing requests (with corresponding routing request return results). In addition, two new messages are also defined for the preferred embodiment: first, a "gateway origination request" (or "gateway origination request invoke") is utilized by a serving MSC to request a DLCI to establish the ATM voice path, and

second, a corresponding response referred to as a "gateway origination request return result" which includes the DLCI of the reserved channel of the PHV of the gateway MSC. The gateway origination request (invoke) preferably includes ANSI-41 parameters such as Billing ID, Dialed Digits, Electronic Serial Number, Mobile Identification Number, Originating MSC Identification (MSCID) (*i.e.*, identification of the serving MSC which is originating an outgoing call from a mobile unit 130), and optionally includes parameters such as Serving Cell ID and Service Option (containing voice coder (vocoder) specific information for a particular call). The gateway origination request return result optionally includes the new DLCI parameter and other ANSI-41 parameters such as Access Denied Reason and Service Option. The various existing parameters are referenced in the subsections comprising section 6.5.2 of the ANSI-41 specification.

[0030] Fig. 4 is a flow diagram illustrating a method embodiment to maintain call control at a gateway mobile switching center 125 having an integrated HLR, utilizing a packet network, for incoming calls from a network 110 in accordance with the present invention. The method begins, step 305, with the reception of an incoming call leg (from the network 110) by the gateway MSC 125 (having an I-HLR) for a particular roaming mobile unit 130. The gateway MSC 125 reserves or allocates a channel on its PHV 250 having a corresponding or designated DLCI for addressing, step 310. With the I-HLR and VLR, the gateway MSC knows where the mobile unit 130 is registered, and as a consequence, the gateway MSC 125 then transmits a routing request invoke message containing the DLCI parameter (and identification of the mobile unit 130) to the serving MSC (115 or 125), step 315. Following a page to and response from the mobile unit 130, the serving MSC 115 or 125 transmits to the gateway MSC 125 a routing request return result (also including the DLCI parameter and a base station 145 address for packets from the gateway PHV 250 for the mobile unit 130), step 320. (In the event the serving MSC 115 or 125 determines not to utilize the ATM link, it will return a temporary location directory number (TLDN) for routing the call over circuit trunk facilities as is currently known in the art, instead of the DLCI parameter.)

[0031] Continuing to refer to Fig. 4, the serving MSC 125 provides the DLCI to the base station 145 that transmits to and receives from the particular mobile unit 130, and the gateway MSC 125 (via processor 210) provides the base station packet address to its PHV 250, step 325, to establish the traffic or bearer path between the base station 145 and the gateway MSC 125 utilizing the ATM link 165 (or other ATM network). The serving MSC 125 (via base station 145) provides an alert to the mobile unit 130, step 330, and when answered in step 335, provides an answer indication message to the gateway MSC 125 and provides a connection or link to the incoming call leg utilizing the ATM link 165, step 340.

Packets from the mobile unit 130 are addressed to the DLCI of the gateway PHV 250, and packets from the PHV 250 are addressed to a call-specific address of the base station 145. Following step 340, the method may end, return step 350. In the event the call is unanswered in step 335, and after a predetermined period of time (no answer time) has elapsed in step 345, the method may also end, return step 350.

[0032] Fig. 5 is a flow diagram illustrating a method embodiment to maintain call control at a gateway mobile switching center 125 having an integrated HLR, utilizing a packet network, for outgoing calls from roaming mobile unit 130 in accordance with the present invention. The method begins, step 400, with the reception by the serving MSC 125 of a request (origination) from a roaming mobile unit 130 (transmitted via base station 145), such as through the entry of dialed digits for an outgoing call (followed by entry of SEND or TALK). The serving MSC 125 determines, from its VLR, that the particular mobile unit has a gateway origination trigger, step 405, and as a consequence, the serving MSC 125 transmits a gateway origination request (invoke) (containing the identification of the mobile unit 130, the dialed digits, the service option (such as a PHV selection (such as for CDMA or TDMA)), the base station 145 address for the call, and other parameters) to the gateway MSC 125, step 410.

[0033] Continuing to refer to Fig. 5, upon reception of the request, the gateway MSC 125 reserves a channel and allocates an address (DLCI) on its PHV 250, step 415, to provide call control at the gateway MSC 125 and to provide feature interactions for incoming calls, such as call waiting or three-way calling, and provides the PHV 250 with a base station 145 address for the particular call. Next, in step 420, the gateway MSC 125 transmits a gateway origination request return result, containing the DLCI and other parameters, to the serving MSC 125. The serving MSC 125, in turn, provides the DLCI to the base station 145 serving the mobile unit 130, step 425, to establish the voice path through the ATM link 165. The gateway MSC 125 then sets up the outgoing call to the network 110 based upon subscriber data and the dialed digits, with a connection or link to the ATM voice path to the outgoing call, step 430. Packets from the mobile unit 130 are addressed to the DLCI of the gateway PHV 250, and packets from the PHV 250 are addressed to a call-specific address of the base station 145. Following step 430, the method may end, return step 435.

[0034] As mentioned above, the call flow diagrams for MSCs 115 having stand-alone HLRs (Figs. 6 and 7) are slightly different than the cases (Figs. 4 and 5) involving integrated HLRs. Fig. 6 is a flow diagram illustrating a method embodiment to maintain call control at a gateway mobile switching center 115 having a stand-alone HLR 155, utilizing a packet network, for incoming calls from a network 110 in accordance with the present invention. The method begins, step 500, with the recep-

tion of an incoming call leg (from the network 110) by the gateway MSC 115 (with VLR) for a particular roaming mobile unit 130. The gateway MSC 115, through information stored in its VLR, knows that the particular roaming mobile unit 130 is registered with a serving MSC that may be able to support packet network call delivery, and as a consequence, the gateway MSC 115 reserves or allocates a channel on its PHV 250 having a corresponding or designated DLCI for addressing, step 505. The gateway MSC 115 then transmits a location request invoke message containing the DLCI parameter (and identification of the mobile unit 130) to the S-HLR 155, step 510. The S-HLR 155 then transmits a routing request invoke message containing the DLCI parameter (and identification of the mobile unit 130) to the serving MSC 115, step 515.

[0035] Continuing to refer to Fig. 6, following a page to and response from the mobile unit 130, the serving MSC 115 transmits a routing request return result (also including the DLCI parameter and a base station 145 address for the particular call) to the S-HLR 155, step 520. (In the event the serving MSC 115 determines not to utilize the ATM link, it will return a temporary location directory number (TLDN) for routing the call over circuit trunk facilities as is currently known in the art, instead of the DLCI parameter.) The S-HLR 155 then transmits to the gateway MSC 115 a location request return result, containing the DLCI (or TLDN), the base station 145 packet address, and the VLR database profile, step 525. The serving MSC 115 then provides the DLCI to the base station 145 which transmits to and receives from the particular mobile unit 130, and the gateway MSC 115 provides the base station packet address to its PHV 250, step 530, to establish the voice path between the base station 145 and the gateway MSC 115 utilizing the ATM link 165. The serving MSC 115 (via base station 145) provides an alert to the mobile unit 130, step 535, and when answered in step 540, provides an answer indication message to the gateway MSC 115 and provides a connection or link to the incoming call leg utilizing the ATM link 165, step 545. Packets from the mobile unit 130 are addressed to the DLCI of the gateway PHV 250, and packets from the PHV 250 are addressed to a call-specific address of the base station 145. Following step 545, the method may end, return step 555. In the event the call is unanswered in step 540, and after a predetermined period of time (no answer time) has elapsed in step 550, the method may also end, return step 555.

[0036] Fig. 7 is a flow diagram illustrating a method embodiment to maintain call control at a gateway mobile switching center 115 having a stand-alone HLR 155, utilizing a packet network, for outgoing calls from roaming mobile unit 130 in accordance with the present invention. The method begins, step 600, with the reception by the serving MSC 115 of a request (origination) from a roaming mobile unit 130 (transmitted via base station 145), such as through the entry of dialed digits for an outgoing call (followed by entry of SEND or TALK). The

serving MSC 115 determines, from its VLR, that the particular mobile unit has a gateway origination trigger, step 605, and as a consequence, the serving MSC 115 transmits (via the S-HLR 155) a gateway origination request (invoke) (containing the identification of the mobile unit 130, the dialed digits, the base station 145 address for the particular call, the service option (such as a PHV selection (such as for CDMA or TDMA)) and other parameters) to the gateway MSC 115, step 610.

[0037] Continuing to refer to Fig. 7, upon reception of the request, the gateway MSC 115 reserves a channel and allocates an address (DLCI) on its PHV 250, and provides its PHV 250 with the base station packet address, step 615, to provide call control at the gateway MSC 115 and to provide feature interactions for incoming calls, such as call waiting or three-way calling. Next, in step 620, the gateway MSC 125 transmits (via the S-HLR 155) a gateway origination request return result, containing the DLCI and other parameters, to the serving MSC 115. The serving MSC 115, in turn, provides the DLCI to the base station 145 serving the mobile unit 130, step 625, to establish the voice path through the ATM link 165. In the event that the gateway MSC 115 does not have a current VLR profile for the roaming mobile unit 130, step 630, the gateway MSC 115 then transmits a qualification request invoke to the S-HLR 155 to obtain the VLR profile, step 635. The S-HLR 155 then transmits to the gateway MSC 115 a qualification request return result containing the VLR profile of the roaming mobile unit 130, step 640. The gateway MSC 115 then sets up the outgoing call to the network 110 based upon subscriber data and the dialed digits, with a connection or link to the ATM voice path to the outgoing call, step 645. Packets from the mobile unit 130 are addressed to the DLCI of the gateway PHV 250, and packets from the PHV 250 are addressed to a call-specific address of the base station 145. Following step 645, the method may end, return step 650.

[0038] Following the establishment of an incoming or outgoing call through the gateway MSC (115 or 125), as illustrated in Figs. 4-7, the gateway MSC may maintain control over any advanced calling features for the mobile unit 130, such as call waiting, call forwarding on busy, busy signal, three-way calling, etc. For example, for call waiting, in the event of a new incoming call from the network 110, the gateway MSC (115 or 125) may transmit an Information Forward message to the serving MSC (115 or 125), which then provides an in-call alert to the mobile unit 130. Conversely, for mobile unit 130 initiated features, such as three-way calling, the mobile unit 130 may provide feature actions to the serving MSC (115 or 125), such as through entry of a flash or a flash with other information. The serving MSC (115 or 125) then transmits a flash request invoke to the gateway MSC (115 or 125), and the gateway MSC (115 or 125) then provides these features, such as three-way calling.

[0039] Numerous advantages of the present invention may be apparent from the above discussion. As in-

dicated above, call control is maintained at the gateway MSC, providing the ability to implement and control advanced calling features for roaming mobile units, especially those features presented as a "line appearance" to the gateway MSC for a particular mobile unit. In addition, toggling (or switching) between multiple calls, such as in call waiting, is performed at a central location, as may be required by various service providers. Another advantage of the various embodiments of the present invention is the utilization of a packet network, such as ATM link 165, rather than circuit switched trunk lines, to create a voice path between serving and gateway MSCs. As a consequence, trunking lines are available for other services, with a corresponding increase in system capacity. In addition, the various embodiments are user friendly and user transparent.

[0040] From the foregoing, it will be observed that numerous variations and modifications may be effected without departing from the spirit and scope of the novel concept of the invention. It is to be understood that no limitation with respect to the specific methods and apparatus illustrated herein is intended or should be inferred. It is, of course, intended to cover by the appended claims all such modifications as fall within the scope of the claims.

Claims

1. A method for maintaining call control at a gateway mobile switching center for a roaming mobile unit utilizing a packet network for bearer traffic transport, the method comprising:
 - (a) receiving an incoming call leg at the gateway mobile switching center for the roaming mobile unit;
 - (b) determining a data link connection identifier for a protocol handler for voice at the gateway mobile switching center;
 - (c) providing the data link connection identifier to a serving mobile switching center and to a base station, and obtaining from the serving mobile switching center a packet address of the base station for communication with the roaming mobile unit to create a packet link between the gateway mobile switching center and the base station;
 - (d) providing an alert to the roaming mobile unit; and
 - (e) when an answer has been received from the roaming mobile unit, providing a connection between the roaming mobile unit and the incoming call leg utilizing the packet link between the gateway mobile switching center and the base station.
2. The method of claim 1, wherein step (c) further com-

prises:

transmitting a routing request invoke containing the data link connection identifier from the gateway mobile switching center to the serving mobile switching center; and
receiving at the gateway mobile switching center a routing request return result containing the base station packet address from the serving mobile switching center.

3. The method of claim 1, wherein step (c) further comprises:

transmitting a location request invoke containing the data link connection identifier from the gateway mobile switching center to a stand-alone home location register;
transmitting a routing request invoke containing the data link connection identifier from the stand-alone home location register to the serving mobile switching center;
receiving at the stand-alone home location register a routing request return result containing the base station packet address and a data link connection identifier result from the serving mobile switching center; and
receiving at the gateway mobile switching center a location request return result containing the base station packet address, the data link connection identifier result and a visitor location register profile from the stand-alone home location register.

4. A method for maintaining call control at a gateway mobile switching center for a roaming mobile unit utilizing a packet network for bearer traffic transport, the method comprising:

(a) receiving an origination having dialed digits at a serving mobile switching center from the roaming mobile unit;
(b) providing to the gateway mobile switching center an identification of the roaming mobile unit, the dialed digits, and a packet address of a base station;
(c) determining a data link connection identifier for a protocol handler for voice at the gateway mobile switching center;
(d) providing the data link connection identifier to the serving mobile switching center and to the base station, to create a packet link between the gateway mobile switching center and the base station; and
(e) transmitting an outgoing call leg from the gateway mobile switching center and providing a connection between the outgoing call leg and the packet link for communication with the

roaming mobile unit utilizing the packet link between the gateway mobile switching center and the base station.

5. The method of claim 4, wherein step (b) further comprises:
transmitting a gateway origination request invoke containing the base station packet address, the mobile identification and the dialed digits, from the serving mobile switching center to the gateway mobile switching center.
6. The method of claim 4, wherein step (d) further comprises:
receiving at the serving mobile switching center a gateway origination request return result containing the data link connection identifier from the gateway mobile switching center.
7. The method of claim 4, wherein step (b) further comprises:
transmitting a gateway origination request invoke containing the base station packet address, the mobile identification and the dialed digits, from the serving mobile switching center, through a stand-alone home location register, to the gateway mobile switching center.
8. The method of claim 4, wherein step (d) further comprises:
receiving at the serving mobile switching center, through a stand-alone home location register, a gateway origination request return result containing the data link connection identifier from the gateway mobile switching center.
9. The method of claim 1 or 4, wherein step (c) further comprises:
providing the base station packet address to the protocol handler for voice.
10. The method of claim 1 or 4, wherein the packet link is at least one of a plurality of packet links, the plurality of packet links comprising an asynchronous transfer mode (ATM) protocol link, an Internet protocol (IP) link, and a frame relay protocol link.
11. The method of claim 1 or 4, wherein the packet link is an asynchronous transfer mode (ATM) protocol link between the gateway mobile switching center and the serving mobile switching center and is a frame relay protocol link between the serving mobile switching center and the base station.
12. A system for maintaining call control at a gateway mobile switching center for a roaming mobile unit utilizing a packet network for bearer traffic transport, the system comprising:

a serving mobile switching center, the serving mobile switching center operative to provide an alert to the roaming mobile unit;

a base station coupled to the serving mobile switching center for wireless communication with the roaming mobile unit, the base station operative to receive a connection link identifier from the serving mobile switching center; and a gateway mobile switching center coupled to the serving mobile switching center, the gateway mobile switching center having a protocol handler for voice, the gateway mobile switching center operative, upon reception of an incoming call leg for the roaming mobile unit, to determine the data link connection identifier for the protocol handler for voice and to provide the data link connection identifier to the serving mobile switching center for transmission to the base station; the gateway switching center further operative to obtain from the serving mobile switching center a packet address of the base station for communication with the roaming mobile unit to create a packet link between the gateway mobile switching center and the base station; and following the alert to the roaming mobile unit, when an answer has been received from the roaming mobile unit, the gateway mobile switching center operative to provide a connection between the roaming mobile unit and the incoming call leg utilizing the packet link between the gateway mobile switching center and the base station.

13. The system of claim 12, wherein the gateway mobile switching center is further operative to transmit a routing request invoke containing the data link connection identifier to the serving mobile switching center, and to receive a routing request return result containing the base station packet address from the serving mobile switching center.

14. The system of claim 12, further comprising:

a stand-alone home location register coupled to the serving mobile switching center and to the gateway mobile switching center.

15. The system of claim 14, wherein the gateway mobile switching center is further operative to transmit a location request invoke containing the data link connection identifier to the stand-alone home location register; the stand-alone home location register is operative to transmit a routing request invoke containing the data link connection identifier to the serving mobile switching center, and to receive a routing request return result containing the base station packet address and a data link connection identifier result from the serving mobile switching center; and wherein the gateway mobile switching

center is further operative to receive a location request return result containing the base station packet address, the data link connection identifier result and a visitor location register profile from the stand-alone home location register.

16. A system for maintaining call control at a gateway mobile switching center for a roaming mobile unit utilizing a packet network for bearer traffic transport, the system comprising:

a serving mobile switching center, the serving mobile switching center operative to receive an origination having dialed digits from the roaming mobile unit;

a base station coupled to the serving mobile switching center for wireless communication with the roaming mobile unit, the base station operative to receive a connection link identifier from the serving mobile switching center; and a gateway mobile switching center coupled to the serving mobile switching center, the gateway mobile switching center having a protocol handler for voice, the gateway mobile switching center operative to receive from the serving mobile switching center an identification of the roaming mobile unit, the dialed digits, and a packet address of the base station, the gateway switching center further operative to determine the data link connection identifier for the protocol handler for voice and to providing the data link connection identifier to the serving mobile switching center to create a packet link between the gateway mobile switching center and the base station; and the gateway mobile switching center further operative to transmit an outgoing call leg and to provide a connection between the outgoing call leg and the packet link for communication with the roaming mobile unit.

17. The system of claim 16, wherein the serving mobile switching center is further operative to transmit to the gateway mobile switching center a gateway origination request invoke containing the base station packet address, the mobile identification and the dialed digits.

18. The system of claim 16, wherein the gateway mobile switching center is further operative to transmit to the serving mobile switching center a gateway origination request return result containing the data link connection identifier.

19. The system of claim 16, further comprising:

a stand-alone home location register coupled to the serving mobile switching center and to the gateway mobile switching center.

20. The system of claim 19, wherein the serving mobile switching center is further operative to transmit a gateway origination request invoke, containing the base station packet address, the mobile identification and the dialed digits, through the stand-alone home location register to the gateway mobile switching center; and wherein the gateway mobile switching center is further operative to transmit a gateway origination request return result, containing the data link connection identifier, through the stand-alone home location register to the serving mobile switching center.
21. The system of claim 12 or 16, wherein the gateway mobile switching center further includes a processor, the processor configured to provide the base station packet address to the protocol handler for voice.
22. The system of claim 12 or 16, wherein the packet link is at least one of a plurality of packet links, the plurality of packet links comprising an asynchronous transfer mode (ATM) protocol link, an Internet protocol (IP) link, and a frame relay protocol link.
23. The system of claim 12 or 16, wherein the packet link is an asynchronous transfer mode (ATM) protocol link between the gateway mobile switching center and the serving mobile switching center and is a frame relay protocol link between the serving mobile switching center and the base station.
24. An apparatus for maintaining call control at a gateway mobile switching center for a roaming mobile unit utilizing a packet network for bearer traffic transport, the roaming mobile unit having a wireless link to a base station, the base station coupled to a serving mobile switching center, the apparatus comprising:
- a network interface for reception of an incoming call leg and for transmission of an outgoing call leg;
 - a protocol handler for voice;
 - a packet network protocol handler; and
 - a processor coupled to the network interface, to the protocol handler for voice, and to the packet network protocol handler, wherein the processor, when operative, is configured to determine a data link connection identifier for the protocol handler for voice and to provide the data link connection identifier to the serving mobile switching center, the processor further configured to receive a base station packet address from the serving mobile switching center and to provide the base station packet address to the protocol handler for voice to create a packet link between the packet network protocol handler and the base station; the processor further configured to provide a connection between the packet link and the incoming call leg for communication with the roaming mobile unit and to provide a connection between the packet link and the outgoing call leg for communication with the roaming mobile unit.
25. The apparatus of claim 24, wherein the processor is further configured to transmit a routing request invoke containing the data link connection identifier to the serving mobile switching center, and to receive a routing request return result containing the base station packet address from the serving mobile switching center.
26. The apparatus of claim 24, further comprising a memory coupled to the processor, wherein the processor is further configured to transmit a location request invoke containing the data link connection identifier to a stand-alone home location register; wherein the processor is further configured to receive from the stand-alone home location register a location request return result containing the base station packet address, a data link connection identifier result and a visitor location register profile, and wherein the processor is further configured to store the visitor location register profile in the memory.
27. The apparatus of claim 24, wherein the processor is further configured to receive a gateway origination request invoke containing the base station packet address, the mobile identification and dialed digits for the outgoing call leg.
28. The apparatus of claim 24, wherein the processor is further configured to transmit a gateway origination request return result containing the data link connection identifier.
29. The apparatus of claim 24, wherein the packet network protocol handler is a protocol handler for asynchronous transfer mode (ATM) and wherein the packet link is an ATM protocol link.
30. The apparatus of claim 24, wherein the packet network protocol handler is a protocol handler for Internet protocol (IP) and wherein the packet link is an IP link.
31. The apparatus of claim 24, wherein the packet network protocol handler is a protocol handler for frame relay and wherein the packet link is a frame relay protocol link.
32. The apparatus of claim 24, wherein the packet network protocol handler is a protocol handler for asynchronous transfer mode (ATM) and wherein a first

portion of the packet link is an asynchronous transfer mode (ATM) protocol link between the gateway mobile switching center and the serving mobile switching center and a second portion of the packet link is a frame relay protocol link between the serving mobile switching center and the base station.

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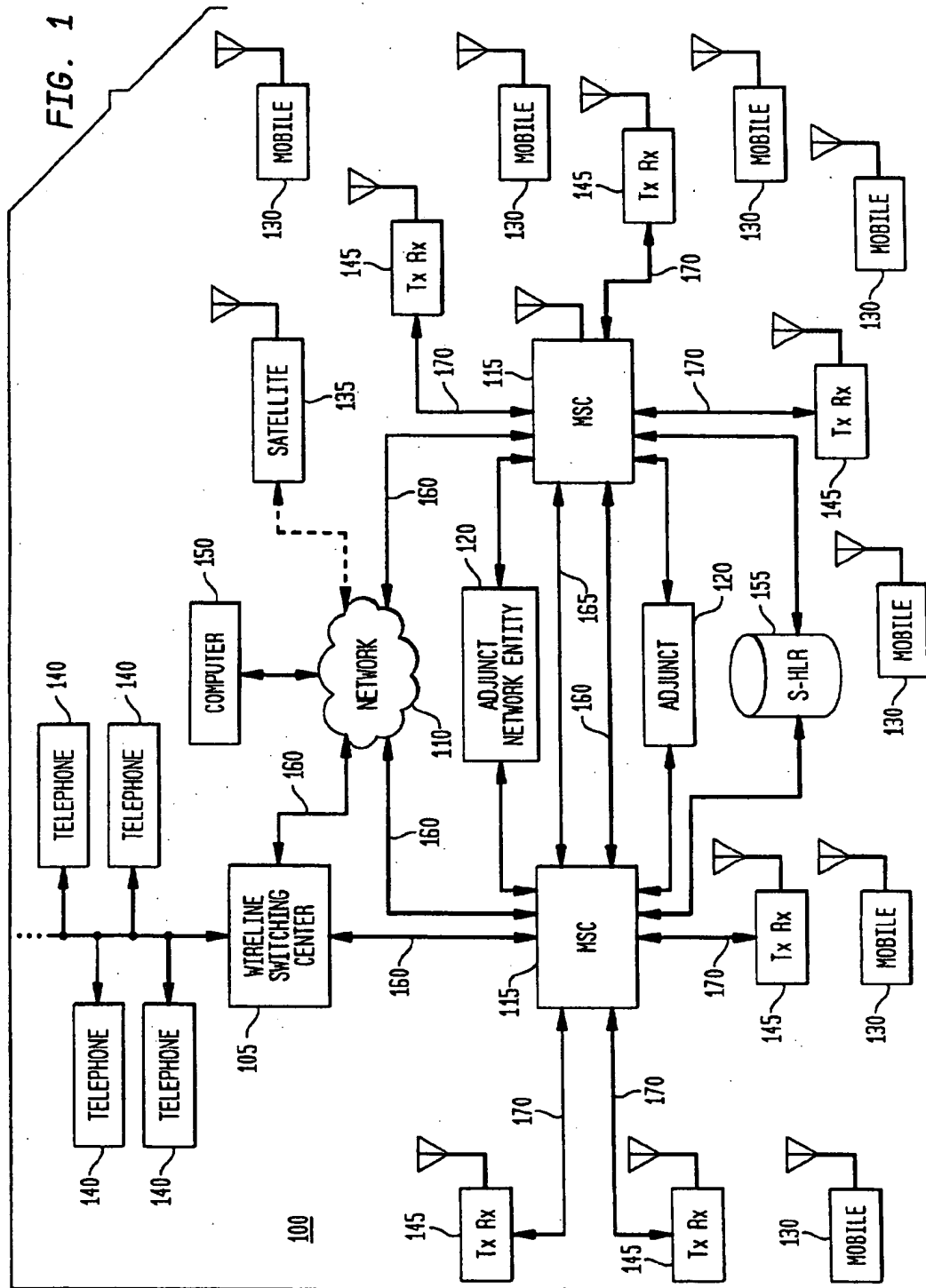


FIG. 2

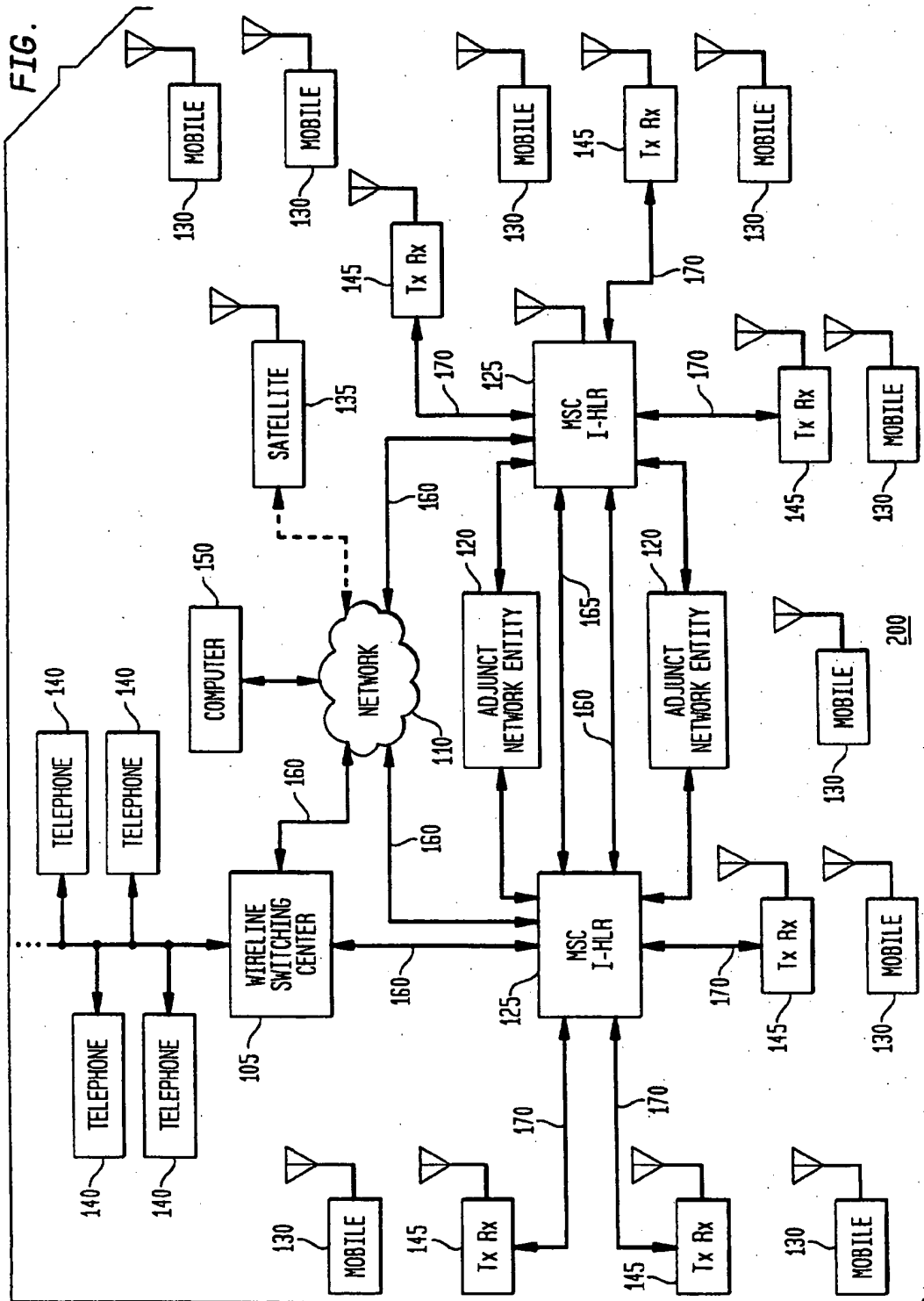


FIG. 3

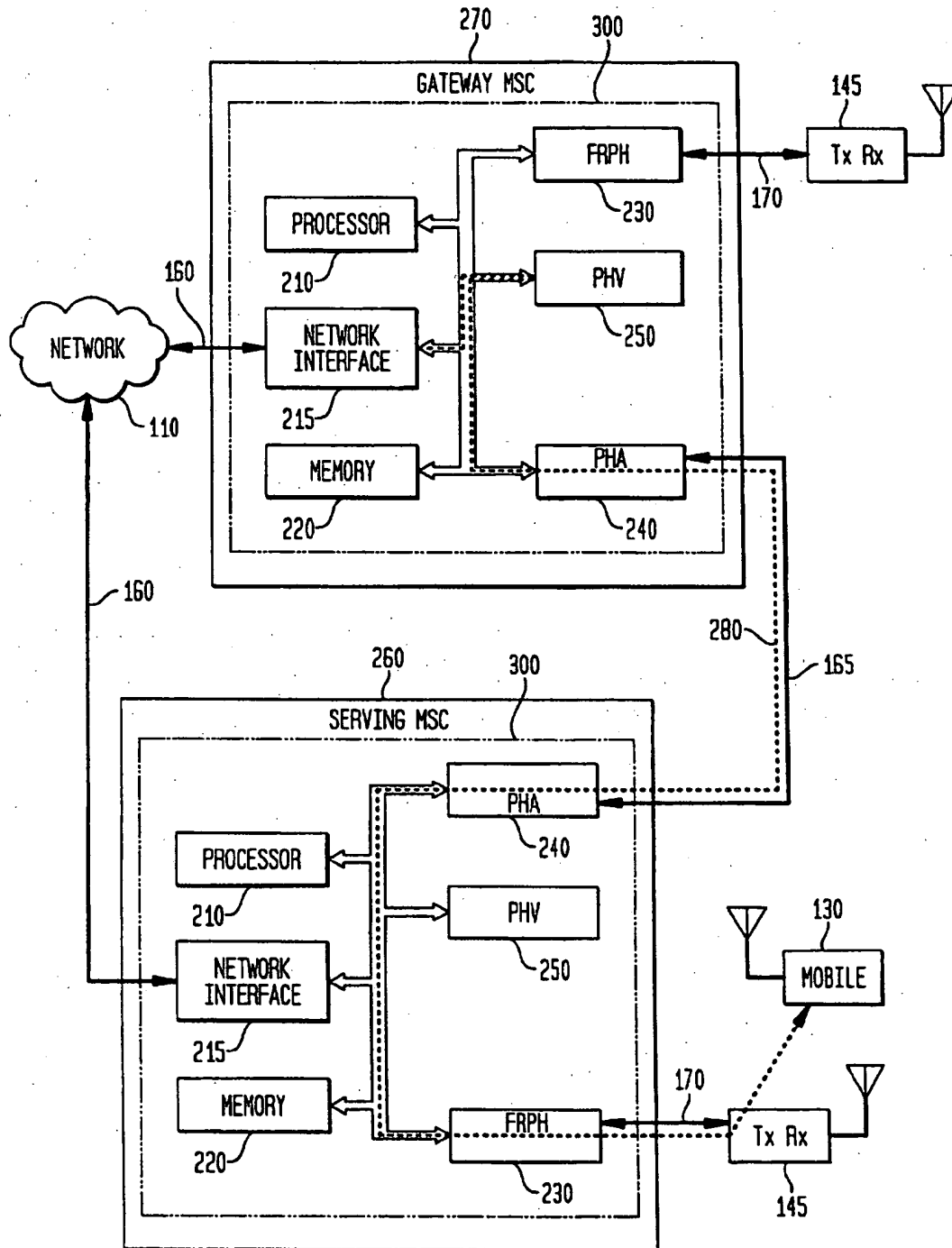


FIG. 4

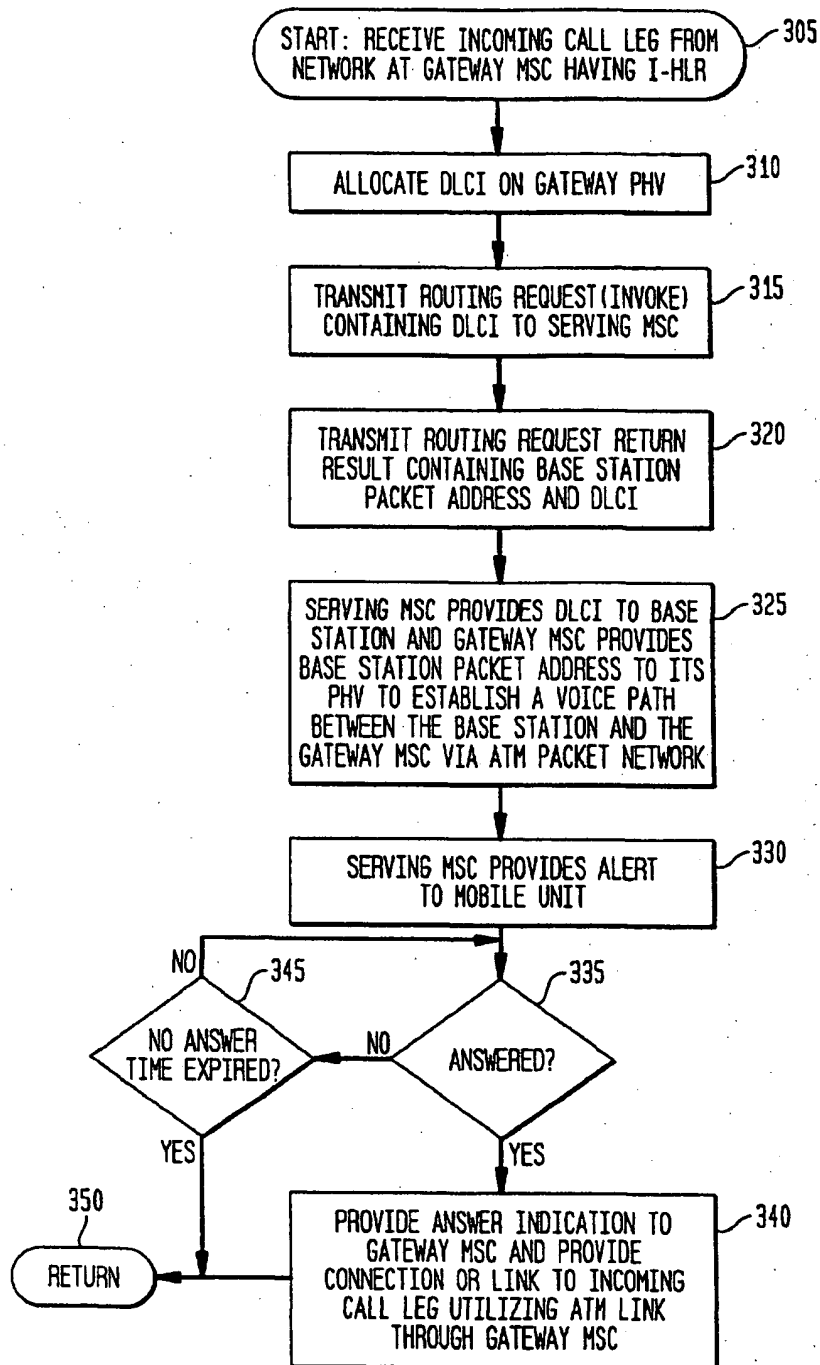


FIG. 5

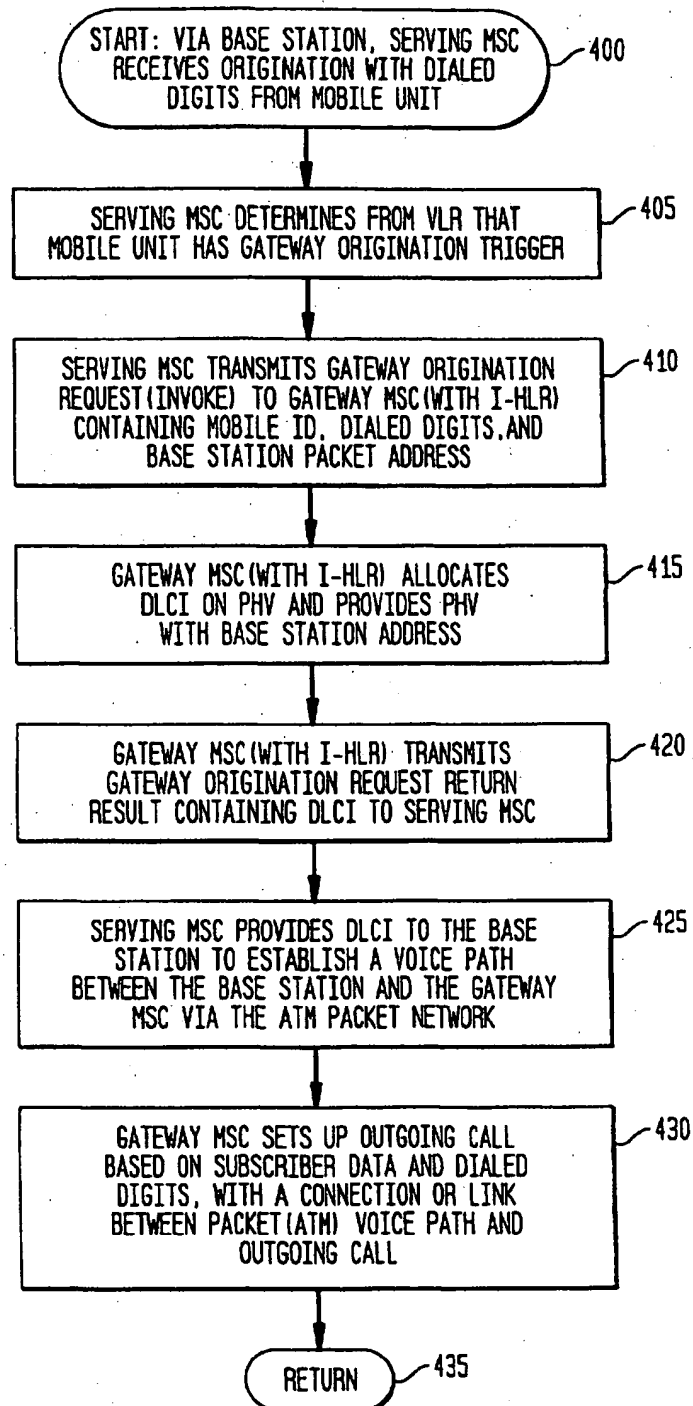


FIG. 6

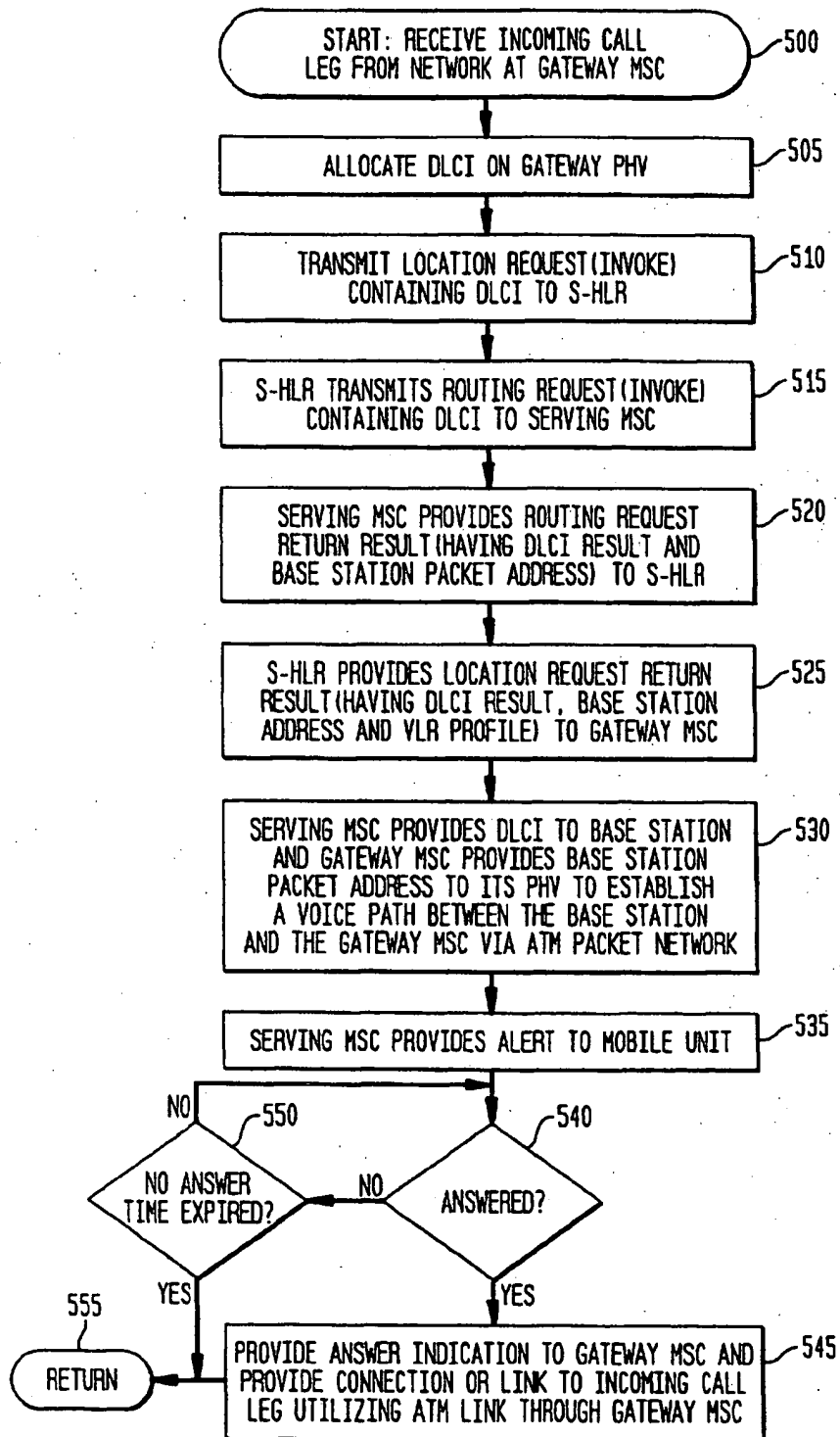
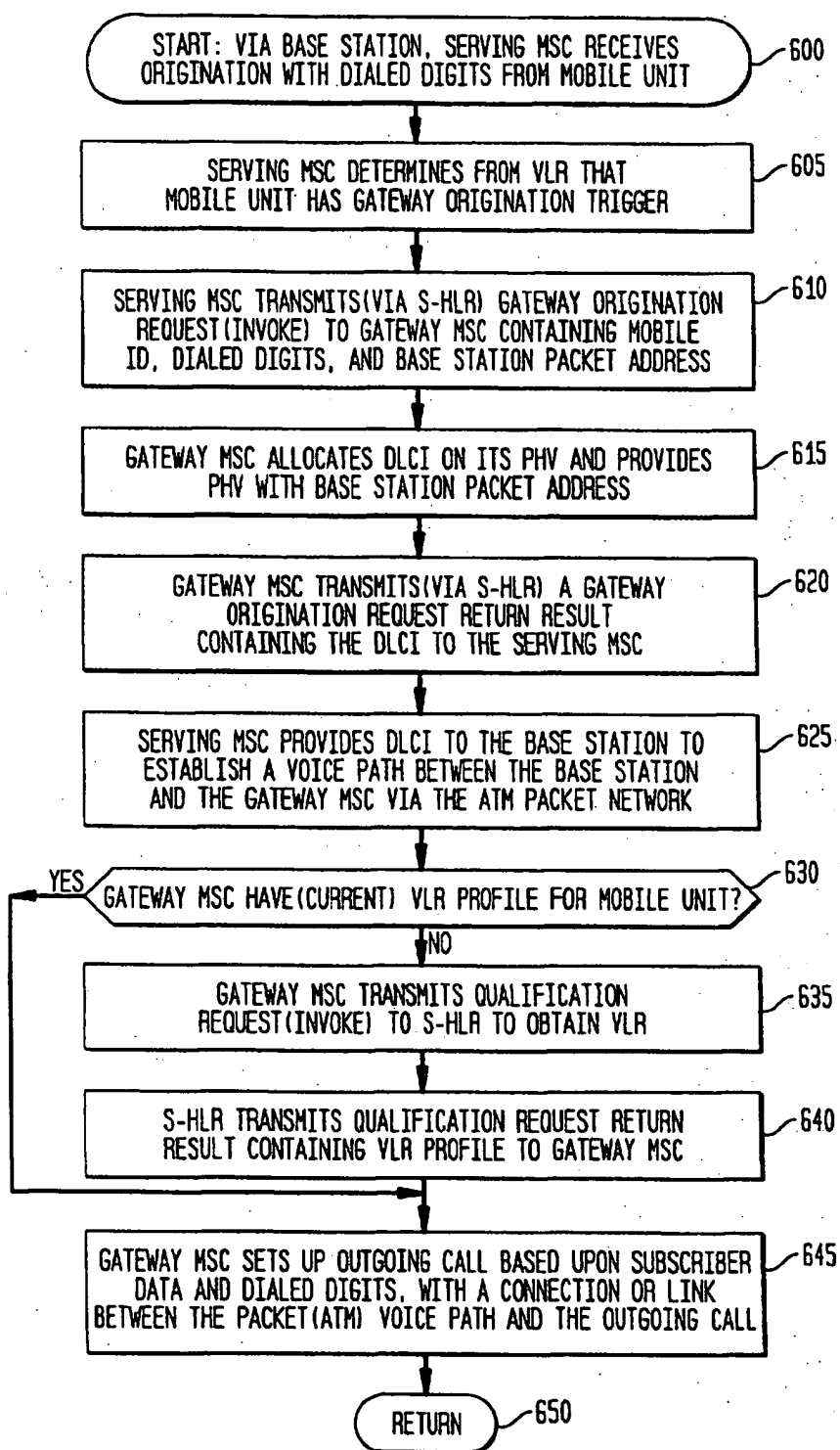


FIG. 7





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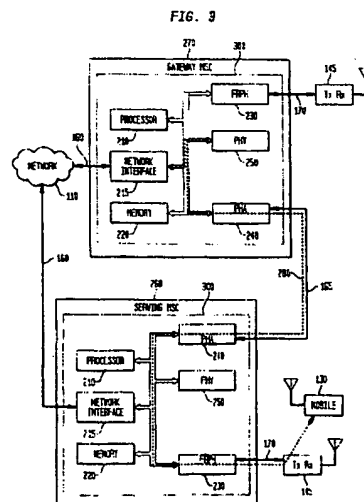
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(54) Apparatus, method and system for maintaining call control at a gateway mobile switching center utilizing a packet network

(57) The apparatus, method and system embodiments of the present invention provide for maintaining call control at a gateway mobile switching center (MSC), for roaming mobile units, utilizing a packet network or link, such as an ATM link. The preferred system embodiment includes a gateway MSC, a serving MSC, and a base station having a wireless link with the roaming mobile unit. The gateway MSC includes a protocol handler for voice (PHV). For any given incoming call for the roaming mobile unit or outgoing call from the roaming mobile unit, the gateway MSC designates a specific address (or channel) on the PHV, referred to as a data link connection identifier (DLCI), for use as an address for voice packets to be received from the roaming mobile unit via the base station and serving MSC, and the base station also provides a base station packet address to the gateway MSC, for use as an address for voice packets to be received from the gateway MSC (through the serving MSC) for the roaming mobile unit, thereby creating a full duplex packet link. The packet link serves as a voice path between the base station, the serving MSC, and gateway MSC, with all communication to and from the roaming mobile unit routed through the gateway MSC. The gateway MSC thereby maintains all call control for the roaming mobile unit for the implementation of advanced calling features, such as call waiting and

three-way calling. In the preferred embodiment, the DLCI is included as a new parameter for ANSI-41 compatible messages. In addition, new ANSI-41 compatible messages are also utilized, a Gateway Origination Request containing the base station packet address and a Gateway Origination Request Return Result containing the new DLCI parameter.



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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 20 November 2002	Examiner Nold, M
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EUROPEAN SEARCH REPORT

Application Number
EP 01 30 3679

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			TECHNICAL FIELDS SEARCHED (IntCl.7)
The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 20 November 2002	Examiner Nold, M
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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			ZA	9604331 A	17-12-1996

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of : Robert T. Calabrese, et al.
For : APPARATUS, METHOD AND SYSTEM FOR
MAINTAINING CALL CONTROL AT A
GATEWAY MOBILE SWITCHING CENTER
UTILIZING A PACKET NETWORK
Serial No. : 09/558,613
Filed : April 26, 2000
Attorney Docket No. : LUTZ 2 00133
Calabrese 10-3-7-16

ASSOCIATE POWER OF ATTORNEY (37 CFR 1.34)

Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

Please recognize as Associate Attorneys in this case:

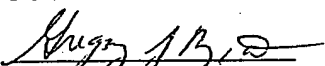
Richard J. Minnich, Reg. No. 24,175
Joseph D. Dreher, Reg. No. 37,123
Patrick D. Floyd, Reg. No. 39,671
John P. Cornely, Reg. No. 41,687

FAY, SHARPE, FAGAN
MINNICH & McKEE, LLP
1100 Superior Avenue, 7th Floor
Cleveland, Ohio 44114-2518
(216) 861-5582

Respectfully submitted,

LUCENT TECHNOLOGIES INC.

Date: 10/9/02


Gregory G. Murgia
Reg. No. 41,209
101 Crawford's Corner Road
Holmdel, NJ 07733
(732) 949-3578

CERTIFICATE OF MAILING

I hereby certify that this Associate Power of Attorney is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Assistant Commissioner of Patents, Washington, D.C. - 20231.

Date: 10/29/02

By: 
Roseanne Giuliani

Please type a plus sign (+) inside this box →



PTO/SB/123 (10-00)

Approved for use through 10/31/2002, OMB 0651-0035

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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CHANGE OF CORRESPONDENCE ADDRESS Patent

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Assistant Commissioner for Patents
Washington, D.C. 20231

Patent Number

Issue Date

Application Number

09/558,613

Filing Date

April 26, 2000

First Named Inventor

Robert T. Calabrese

Please change the Correspondence Address for the above-identified patent to:

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44114-2518

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I am the :



Patentee.



Assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96).



Attorney or agent of record.

Typed or
Printed Name

Joseph D. Dreher, Reg. No. 37,123

Signature

Date

10/29/02

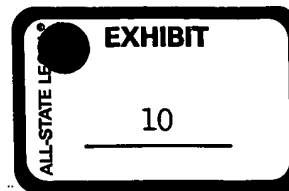
NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.

☐ Total of _____ forms are submitted.

Burden Hour Statement: This form is estimated to take 3 minutes to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

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Patents, Washington, DC 20231, on 10/29/02

(SIGNATURE)
Rosanne Giuliani

Commissioner for Patents
Washington, DC 20231
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APPLICATION NUMBER	FILING DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	DRAWINGS	TOT CLAIMS	IND CLAIMS
09/558,613	04/26/2000	2642	1380	Calabrese 10-3-7-16	7	54	4

LUTZ 200133

CONFIRMATION NO. 9462

Fay Sharpe Fagan Minnich & McKee LLP
1100 Superior Avenue
Seventh Floor
Cleveland, OH 44114-2518

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NOV 15 2002

CORRECTED FILING RECEIPT



OC000000009088705

FAY, SHARPE, FAGAN,
MINNICH & MCKEE, LLP

Date Mailed: 11/08/2002

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Applicant(s)

Robert Thomas Calabrese, Naperville, IL;
Thomas Edward Hidepohl, Geneva, IL;
Douglas Harvey Riley, Naperville, IL;
Robin Jeffrey Thompson, Batavia, IL;

Domestic Priority data as claimed by applicant**Foreign Applications****If Required, Foreign Filing License Granted 07/07/2000****Projected Publication Date:** None, application is not eligible for pre-grant publication**Non-Publication Request:** No**Early Publication Request:** No**Title**

Apparatus, method and system for maintaining call control at a gateway mobile switching center
utilizing a packet network

"DOCKETED"

Preliminary Class

379

**LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15**

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This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Office of Export Administration, Department of Commerce (15 CFR 370.10 (j)); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF : Calabrese, et al.
FOR : **APPARATUS, METHOD AND
SYSTEM FOR MAINTAINING CALL
CONTROL AT A GATEWAY
MOBILE SWITCHING CENTER
UTILIZING A PACKET NETWORK**
SERIAL NO. : 09/558,613
FILED : April 26, 2000
EXAMINER : Unknown
GROUP ART UNIT : 2642
ATTORNEY DOCKET NO. : LUTZ 2 00133
Calabrese 10-3-7-16

REQUEST FOR CORRECTED FILING RECEIPT

Assistant Commissioner For Patents
Office of Initial Patent Examination's
Customer Service Center
Washington, D.C. 20231

Dear Sir:

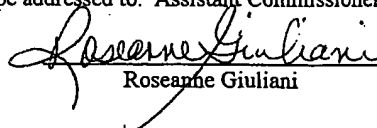
Attached is a copy of the Official Filing Receipt received from the PTO in the above application for which issuance of a corrected Filing Receipt is respectfully requested.

There is an error in the Applicant(s) section. One of the named inventors name should read as follows:

Thomas Edward Hudepohl

CERTIFICATE OF MAILING

I hereby certify that this Request For Corrected Filing Receipt is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Assistant Commissioner For Patents, Washington, D.C. 20231, on November 27, 2002.

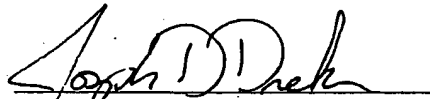

Roseanne Giuliani

Also, the Filing Fee Received, Total Claims and Independent Claims are incorrect.
The fee amount sent at the filing of this application was \$1,494.00. The total claims is 56 and independent claims is 5.

The correction is not due to any error by Applicants and it is believed no fee is due.
However, if any fees are required, please charge Deposit Account No. 06-0308.

Respectfully submitted,

FAY, SHARPE, FAGAN,
MINNICH & McKEE, L.L.P.

A handwritten signature in black ink, appearing to read "Joseph D. Dreher", written over a horizontal line.

Joseph D. Dreher
Reg. No. 37,123
1100 Superior Avenue
Seventh Floor
Cleveland, Ohio 44114-2518
(216) 861-5582



Commissioner for Patents
Washington, DC 20231
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APPLICATION NUMBER	FILING DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	DRAWINGS	TOT CLAIMS	IND CLAIMS
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09/558,613

04/26/2000

2642

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Calabrese
10-3-7-16

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CONFIRMATION NO. 9462

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CORRECTED FILING RECEIPT



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Date Mailed: 11/08/2002

Receipt is acknowledged of this regular Patent Application. It will be considered in its order and you will be notified as to the results of the examination. Be sure to provide the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION when inquiring about this application. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please write to the Office of Initial Patent Examination's Filing Receipt Corrections, facsimile number 703-746-9195. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections (if appropriate).

Applicant(s)

Robert Thomas Calabrese, Naperville, IL;
Thomas Edward Hudepohl, Geneva, IL;
Douglas Harvey Riley, Naperville, IL;
Robin Jeffrey Thompson, Batavia, IL;

Hudepohl

Domestic Priority data as claimed by applicant

Foreign Applications

If Required, Foreign Filing License Granted 07/07/2000

Projected Publication Date: None, application is not eligible for pre-grant publication

Non-Publication Request: No

Early Publication Request: No

Title

Apparatus, method and system for maintaining call control at a gateway mobile switching center
utilizing a packet network

"DOCKETED"

Preliminary Class

379

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

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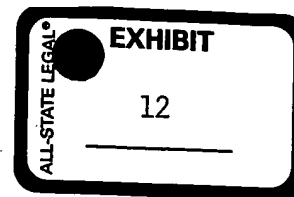
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The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Office of Export Administration, Department of Commerce (15 CFR 370.10 (j)); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

Commissioner for Patents
Washington, DC 20231
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APPLICATION NUMBER	FILING DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	DRAWINGS	TOT CLAIMS	IND CLAIMS
09/558,613	04/26/2000	2642	1380	Calabrese 10-3-7-16	7	54	4

LUTER 200133

CONFIRMATION NO. 9462

Fay Sharpe Fagan Minnich & McKee LLP
1100 Superior Avenue
Seventh Floor
Cleveland, OH 44114-2518

DEC 20 2002

FAY, SHARPE, FAGAN,
MINNICH & MCKEE, LLP

Date Mailed: 12/16/2002

Receipt is acknowledged of this regular Patent Application. It will be considered in its order and you will be notified as to the results of the examination. Be sure to provide the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION when inquiring about this application. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please write to the Office of Initial Patent Examination's Filing Receipt Corrections, facsimile number 703-746-9195. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections (if appropriate).

Applicant(s)Robert Thomas Calabrese, Naperville, IL;
Thomas Edward Hudepohl, Geneva, IL;
Douglas Harvey Riley, Naperville, IL;
Robin Jeffrey Thompson, Batavia, IL;**Domestic Priority data as claimed by applicant****Foreign Applications**

If Required, Foreign Filing License Granted: 07/07/2000

Projected Publication Date: None, application is not eligible for pre-grant publication

Non-Publication Request: No

Early Publication Request: No

TitleApparatus, method and system for maintaining call control at a gateway mobile switching center
utilizing a packet network

Preliminary Class
379

**LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15**

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NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).



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APPLICATION NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
09/558,613	04/26/2000	Robert Thomas Calabrese	Calabrese 10-3-7-16

LUTZ 2 00133

CONFIRMATION NO. 9462

Fay Sharpe Fagan Minnich & McKee LLP
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Seventh Floor
Cleveland, OH 44114-2518



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DEC 20 2002

Date Mailed: 12/16/2002

FAY, SHARPE, FAGAN,
MINNICH & MCKEE, LLP

RESPONSE TO REQUEST FOR CORRECTED FILING RECEIPT

Claims, Fees, and Inventors

In response to your request for a corrected Filing Receipt, the Office is unable to comply with the request because:

☐ The total number of claims appearing on the Filing Receipt does not include multiple dependent claims. The total fee appearing on the Filing Receipt includes the cost of multiple dependent claims that were present at the time the application was filed.

☐ The filing fee is correct. It may include additional claims fees and/or the surcharge under 37 CFR 1.16(e) for filing an oath/declaration or basic filing fee after the application filing date; or it may not reflect fees refunded to the applicant that were paid by mistake.

☒ The number of claims reflected on the filing receipt is correct. Upon review of the claims, it was found that there was a miscalculation by the applicant. This may be due to oversight.

☒ The filing fee reflected on the filing receipt is correct. Applicant may have miscalculated the fees due.

☐ Applicant calculated fees as other than small entity; however, applicant asserted small entity status in the application. Therefore, fees were applied as small entity and the remainder was refunded to the applicant.

☐ The Office will not engage in double correspondence with an applicant and a registered attorney or agent, or with more than one registered attorney or agent except as deemed necessary by the Commissioner. If more than one correspondence address is specified, the Office will establish one as the correspondence address. See 37 CFR 1.33 (a)

"DOCKETED"

- ☐ The difference between the fees paid and the fees due was refunded to the applicant and will not be shown on the filing receipt.
- ☐ The inventor information may be truncated if the family name consists of more than 50 characters (letters and spaces combined) and if the given name consists of more than 50 characters (letters and spaces combined).
- ☐ The inventor's residence allows for up to 40 characters (letters and spaces combined).
- ☐ The inventor's residence will only include the city and state for U.S. residences or city and country for residences outside the U.S. (See MPEP 605.02).
- ☐ A petition to correct the inventorship is needed to make this change. See 37 CFR 1.48. For non-provisional applications, the petition should be directed to the Director of the examining group assigned to your application.
- ☐ Changes made after submission of an executed declaration to the inventor information other than correction of typographical errors must be submitted in the form of a substitute declaration. Change of inventorship requires a petition under 37 CFR 1.48.
- ☐ The number of drawings shown on the filing receipt reflects the number of drawing sheets submitted and is not necessarily equal to the number of figures submitted.
- ☐ The correspondence address was captured as directed by applicant on filing. If you wish correspondence to be directed otherwise, please submit a request for a change of address.
- ☐ The docket number allows a maximum of 25 characters.
- ☐ The person signing on behalf of the deceased inventor is reflected on the Filing Receipt as the legal representative.
- ☐ The filing date of a parent application cannot be changed by this request. A petition to correct the filing date in the parent application is required.
- ☐ Honorific titles, such as Dr. Mr. Mrs., Ph.D. etc. are not captured in the applicant's information. Application

Anthony W. Legare

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13

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/558,613	04/26/2000	Robert Thomas Calabrese	Calabrese 10-3-7-16	9462

7590 03/15/2004
Fay Sharpe Fagan Minnich & McKee LLP
1100 Superior Avenue
Seventh Floor
Cleveland, OH 44114-2518

EXAMINER

AL AUBAIDI, RASHA S

ART UNIT	PAPER NUMBER
2642	

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MAR 19 2004

FAY, SHARPE, BEALL, FAGAN,
MINNICH & MCKEE

DATE MAILED: 03/15/2004

LUT 200133

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/558,613

Applicant(s)

CALABRESE ET AL.

Examiner

Rasha S AL-Aubaidi

Art Unit

2642

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 April 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-54 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-54 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 4. 1/30/2003.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103 (a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 1-8, 10-24, 26-41, and 50-54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eisdorfer (US Pat # 5,724,411) in view of Novak (US Pat # 4,266,098).

Regarding claim 1-2, Eisdorfer teaches a multiple leg telecommunication session (see col. 2, lines 44-50), comprising: (a) receiving an incoming call leg designating a

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primary directory number (this reads on the primary directory number see col.2, lines 63-66, col. 5, lines 31-33); (b) determining a plurality of secondary directory numbers associated with the primary directory number (this reads on the telephone sets 121,122, and 127, see col. 4, lines 55-58); (c) processing and routing each outgoing call leg associated with each secondary directory number, of the plurality of secondary directory numbers (see col. 2, lines 44-50, and col. 3, lines 1-16); (e) when an outgoing call leg, of the plurality of an outgoing call legs, has been unconditionally answered, providing a connection between the unconditionally answered outgoing call leg and the incoming call leg to form a communication session, (this simply reads on the normal call acceptance, see col. 3, lines 20-26).

However, Eisdorfer does not specifically teach when an outgoing call leg, of the plurality of an outgoing call legs, has been conditionally answered, providing the called party information on the conditionally answered outgoing leg, which means allowing the called party to screen and view the calling party information before answering the incoming call.

Novak teach a device that monitors certain information in an incoming call. Novak also provides screening capabilities to the called party by giving him/her the option of answering or not answering certain phone call (see col. 1, lines 11-24, col.2, lines 42-46, lines 57-68, and col.3, lines 9-33).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the feature of screening calls prior to answering an incoming call, as taught by Novak, into the Eisdorfer system in order to provide the user or the called party the option of accepting or rejecting calls, also to prevent the user from answering an unwanted calls. On one hand, the user may be accepting important calls from family members, emergency situations, or important people at any time. On the other hand, the user may reject non-important calls or calls from unwanted callers.

Claims 17-18 are rejected for the same reasons as discussed above with respect to claim 1. Also the claimed database that stores the secondary numbers reads on database 175, see col.3, lines 1-9, col.5, lines 24-25, also Fig. 1 175 within SCP 170.

Claims 34-35 are rejected for the same reasons as discussed above with respect to claim 1. The claimed network interface reads on the SSPs 110, 120, 125, and 130 see Fig.1. The claimed processor reads on elements 113, 123, and 133, Fig.1, also the memory reads on database 175.

Claim 50 is rejected for the same reasons as discussed above with respect to claim 1. Also, the use of the home location register feature is inherent in mobile communication. Eisdorfer discloses the use of mobile communication (see col.4, lines 66-67).

Regarding claims 3, 19, and 36, Eisdorfer teaches providing a listing of a plurality of options to a calling party; in response, receiving an option selection from the calling party; and based upon the option selection, determining the called party information (see col.3, lines 1-9).

Regarding claims 4-6, 20-22, 37-39 and 53, the claimed feature of the language, service selection, and product selection are obvious. These are typical menu options such as "for Spanish press 1, for English press 2", or "for car insurance, press 1, for shipping, press 2".

Regarding claims 7, 23, 40 the use of ANSI-41 protocol is obvious at least in the mobile communications.

Claims 8, 24, 41, and 51 are rejected for the same reasons as discussed above with respect to claims 3, 19, and 36.

Regarding claims 10, 26, and 43, Novak teaches a conditional answering is indicated by entry of a predetermined code on an outgoing call leg of the plurality of outgoing call legs (the entry of a predetermined code reads on entering codes such as 1-2-3 to Mary Jones, 2-2-2 to John Doe, and 3-3-3 to John Smith, see col. 61-68).

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Regarding claims 11, 27, and 44, for the claimed feature if conditional answering that is indicated by an off hook, this is inherent if is not obvious.

Regarding claims 12, 28, and 45, Eisdorfer teaches when a conditionally answered outgoing call leg has not provided an unconditional answer within a predetermined period of time releasing the conditionally answered outgoing call leg (see col.3, lines 19-26).

Regarding claims 13, 29, and 46, the claimed feature of releasing all remaining outgoing call legs in the event of establishment of a communication session. This is obvious because once the call was answered conditionally or unconditionally other, outgoing call legs normally would be dropped. The called person has been found and has answered the call.

Regarding claims 14, 30, and 47, Eisdorfer teaches the called party information includes the primary directory number (see col. 3, lines 1-20).

Regarding claims 15, 31, and 48, Eisdorfer teaches the called party information includes a distinctive identifier for the multiple leg telecommunication session (this may read on the distinctive alerting signal or a distinctive ring, see col.3, lines 41-48; see also, Fig.6).

Regarding claims 16, 32, and 49, Eisdorfer teaches the called party information includes an indication of an amount of outgoing call legs in the plurality of outgoing call legs. This simply reads on identifying how many destinations the call will be alerting, such as father, mother, child, or even home, vacation home, car,...etc. See also Figs.5 and 6.

Claim 54 is rejected for the same reasons as discussed above with respect to claims 14-16, 30-32, and 47-49, respectively.

Claim 52 is rejected for the same reasons as discussed above with respect to claims 3, 19, and 36.

3. Claims 9, 25, 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eisdorfer in view of Novak and further in view of Furman et al (US PAT # 6,049,594).

Neither Eisdorfer nor Novak in combination or alone teaches the feature of requesting a name form a calling party; storing in a memory a calling party name received in response; and including the calling party name in the called party information.

Furman teaches that in the event of receiving a call, the switch 30 connects the call to an audio response system 35, which plays an audio greeting to the calling party. However, when no ANI is available to identify this customer or that call, the calling party would be prompted by the system 35 to identify himself, by entering an ID code which may be the customer telephone number (see col.6, lines 49-62).

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Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to prompt the calling party for his/her phone number or his/her name as taught by Furman into the combination of Eisdorfer and Novak in order to provide caller ID information to the called party. The advantages of providing calling party information to the called party are obvious and well known.

Conclusion

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rasha S AL-Aubaidi whose telephone number is (703) 605-5145. The examiner can normally be reached on Monday-Friday from 7:30 am to 4:30 Pm.

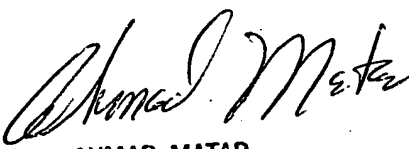
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ahmad F Matar, can be reached on (703) 305-4731. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9314.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-4700.

Examiner

Rasha Al-Aubaidi

02/25/2004


AHMAD MATAR
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600

Notice of References Cited

Application/Control No.

09/558,613

Applicant(s)/Patent Under
Reexamination
CALABRESE ET AL.

Examiner

Rasha S AL-Aubaidi

Art Unit

2642

Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
	A	US-4,266,098	05-1981	Novak, Albert P.	379/77
	B	US-5,724,411	03-1998	Eisdorfer et al.	379/93.23
	C	US-6,049,594	04-2000	Furman et al.	379/67.1
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Subst. Form PTO-1449

Atty. Docket No.: LUTZ 2 00133

Serial No.: 09/558,613

APPLICANT'S INFORMATION
DISCLOSURE STATEMENT

Applicant(s): Calabrese, et al.

Filing Date: April 26, 2000

Group: 2642

JAN 13 2003

PATENT & TRADEMARK OFFICE

U.S. PATENT DOCUMENTS

Initial*	Document No.	Date	Name	Class	Subcl.	Filing Date
	AA					
	AB					
	AC					
	AD					
	AE					
	AF					
	AG					
	AH					

RECEIVED

JAN 14 2003

Technology Center 2600

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	Document No.	Date	Country	Class	Subcl.	Translation?
R.S.	AI	EP 0 883 316 A1	09.12.1998	European		
R.S.	AJ	EP 0 902 595 A2	17.03.1999	European		
R.S.	AK	WO 99/33250	1 July 1999	PCT		
R.S.	AL	EP 0 783 217 A2	09.07.1997	European		
R.S.	AM	WO 96/42176	27 December 1996	PCT		

OTHER ART

	AN	European Search Report
R.S.	AO	Anna Balakrishnan, "Wireless and Service Mobility", 1997 Annual Review of Communications, pp.859-865, 1997.
	AP	

Examiner:

Date Considered:

2/25/04

*

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if in conformance and not considered. Include copy of this form with next communication to applicant.



US006307929B1

EXHIBIT

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ALL-STATE LEGAL®

(12) **United States Patent**
Baiyor et al.

(10) Patent No.: **US 6,307,929 B1**
(45) Date of Patent: ***Oct. 23, 2001**

(54) **APPARATUS, METHOD AND SYSTEM FOR PROVIDING CONDITIONAL ANSWERING IN MULTIPLE LEG TELECOMMUNICATION SESSIONS**

(75) Inventors: **Robert John Baiyor; Deborah Thomas Earl**, both of Naperville; **Harold Robert Smith, Jr.**, Oakbrook Terrace; **Thomas Dale Strom**, Naperville, all of IL (US)

(73) Assignee: **Lucent Technologies Inc.**, Murray Hill, NJ (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **09/558,578**

(22) Filed: **Apr. 26, 2000**

(51) Int. Cl.⁷ **H04M 3/42; H04M 7/00**

(52) U.S. Cl. **379/211.02; 379/211.01; 379/207.1; 379/219; 370/58.2; 370/94.1**

(58) Field of Search **379/211.02, 211.01, 379/207.1, 219; 370/58.2, 94.1**

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,426,634 * 6/1995 Cote et al. 370/58.1
6,111,943 * 9/1998 Strom et al. 379/211.01

* cited by examiner

Primary Examiner—Ahmad Matar

Assistant Examiner—Thijuan P. Knowlin

(74) Attorney, Agent, or Firm—Nancy R. Gamburd

(57) **ABSTRACT**

An apparatus, method and system provide for conditional answering in multiple leg telecommunication sessions, such as in a flexible alerting service. The preferred system includes a home location register (HLR) coupled to a mobile switching center (MSC). The HLR has, stored in a memory, a plurality of secondary directory numbers associated with a primary directory number, such as an ANSI compatible pilot directory number. The MSC has an interface for receiving an incoming call leg designating the primary directory number and for processing and routing each outgoing call leg associated with each secondary directory number. Following reception of a directive from the HLR, the MSC obtains information from a calling party to create called party information. When an outgoing call leg has been conditionally answered, the MSC provides the called party information on the conditionally answered outgoing call leg. Upon reception of the information, the called party may decide to accept the call, through an unconditional answer, or may hold or release the call. In the preferred embodiment, the called party information may include options or selections entered by the calling party, the name of the calling party, routing information, language selections, and product or service selections. Following an unconditional answer of an outgoing call leg, the MSC provides a connection between the unconditionally answered outgoing call leg and the incoming call leg to form a communication session.

54 Claims, 6 Drawing Sheets

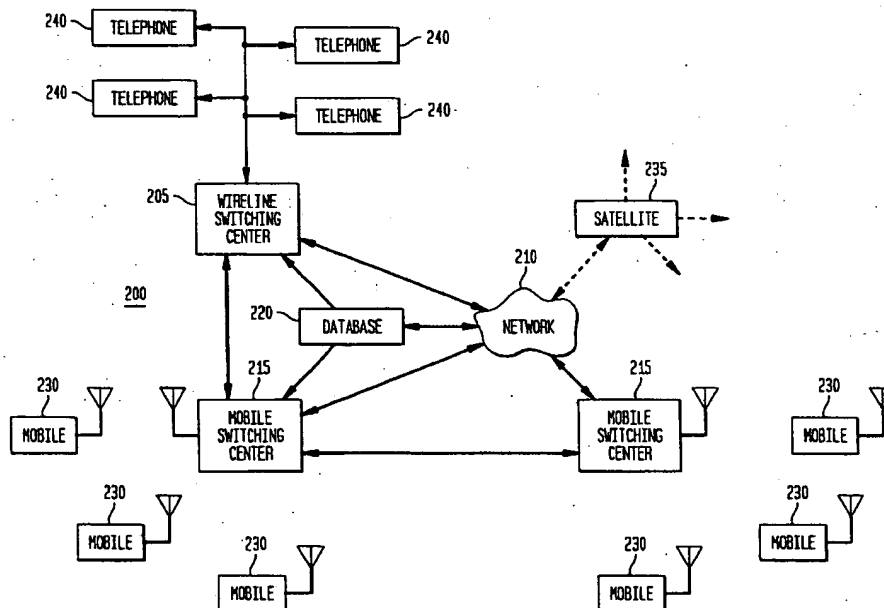


FIG. 1A

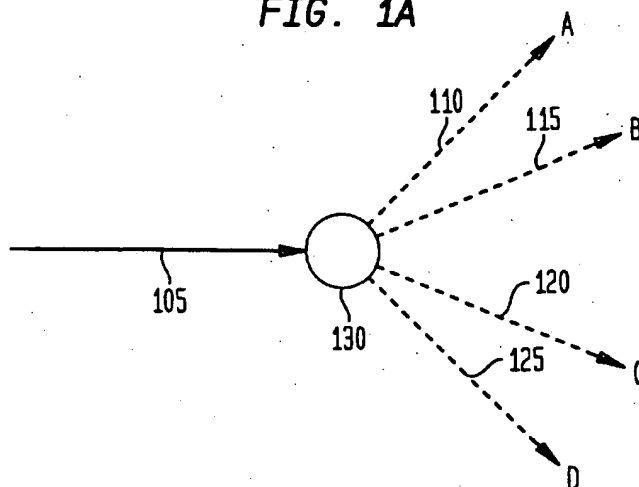


FIG. 1B

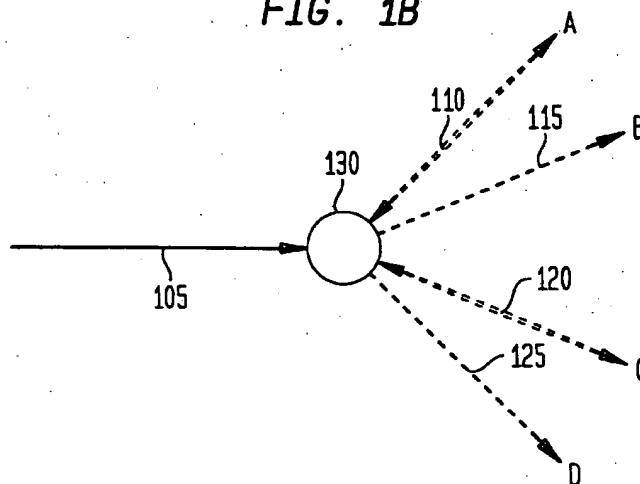
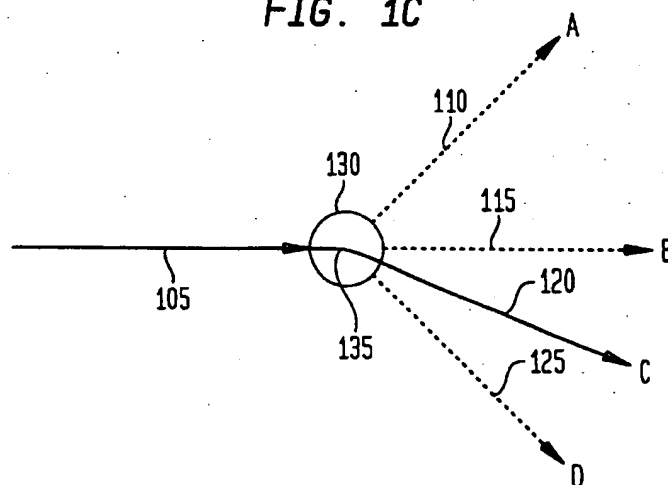
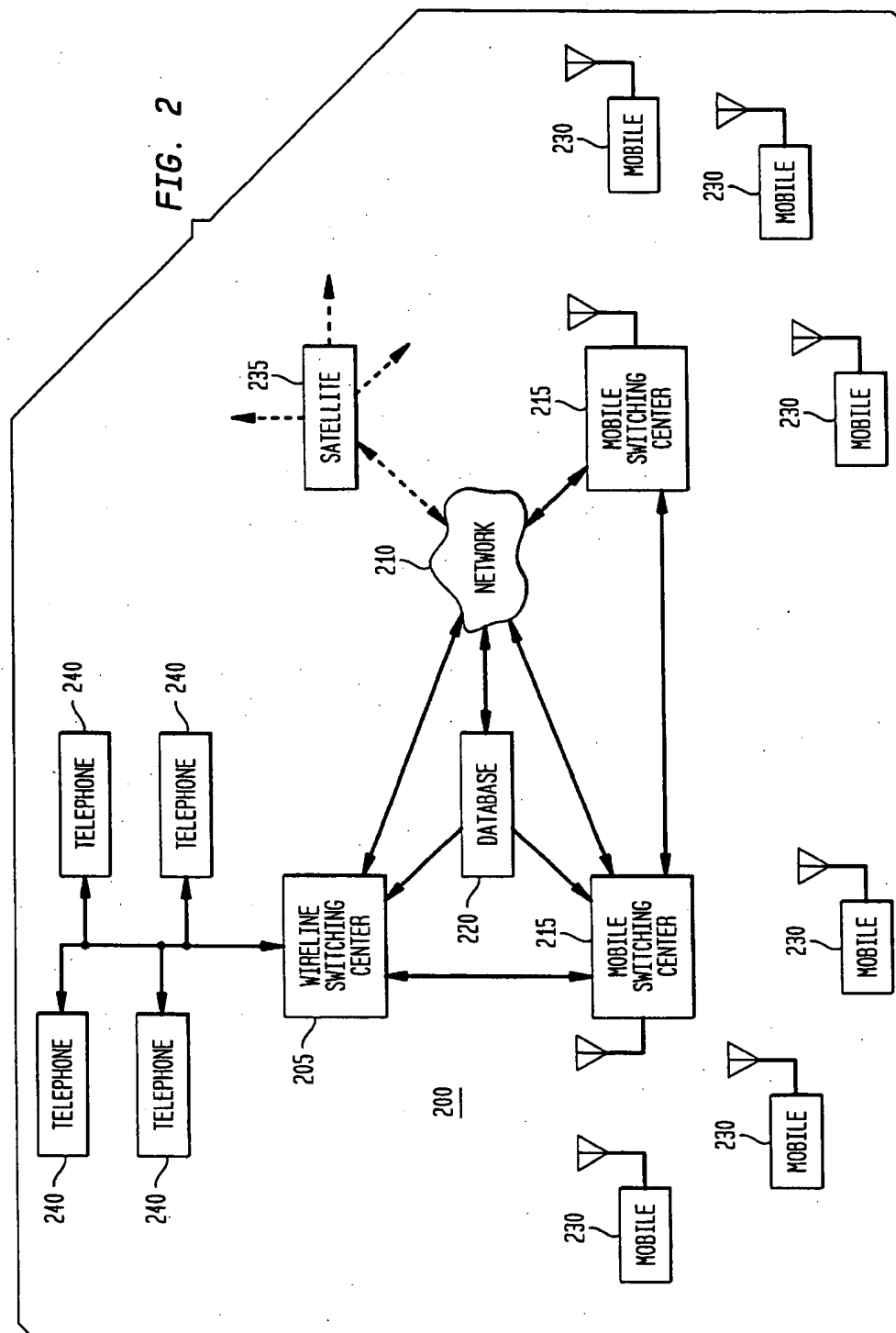


FIG. 1C





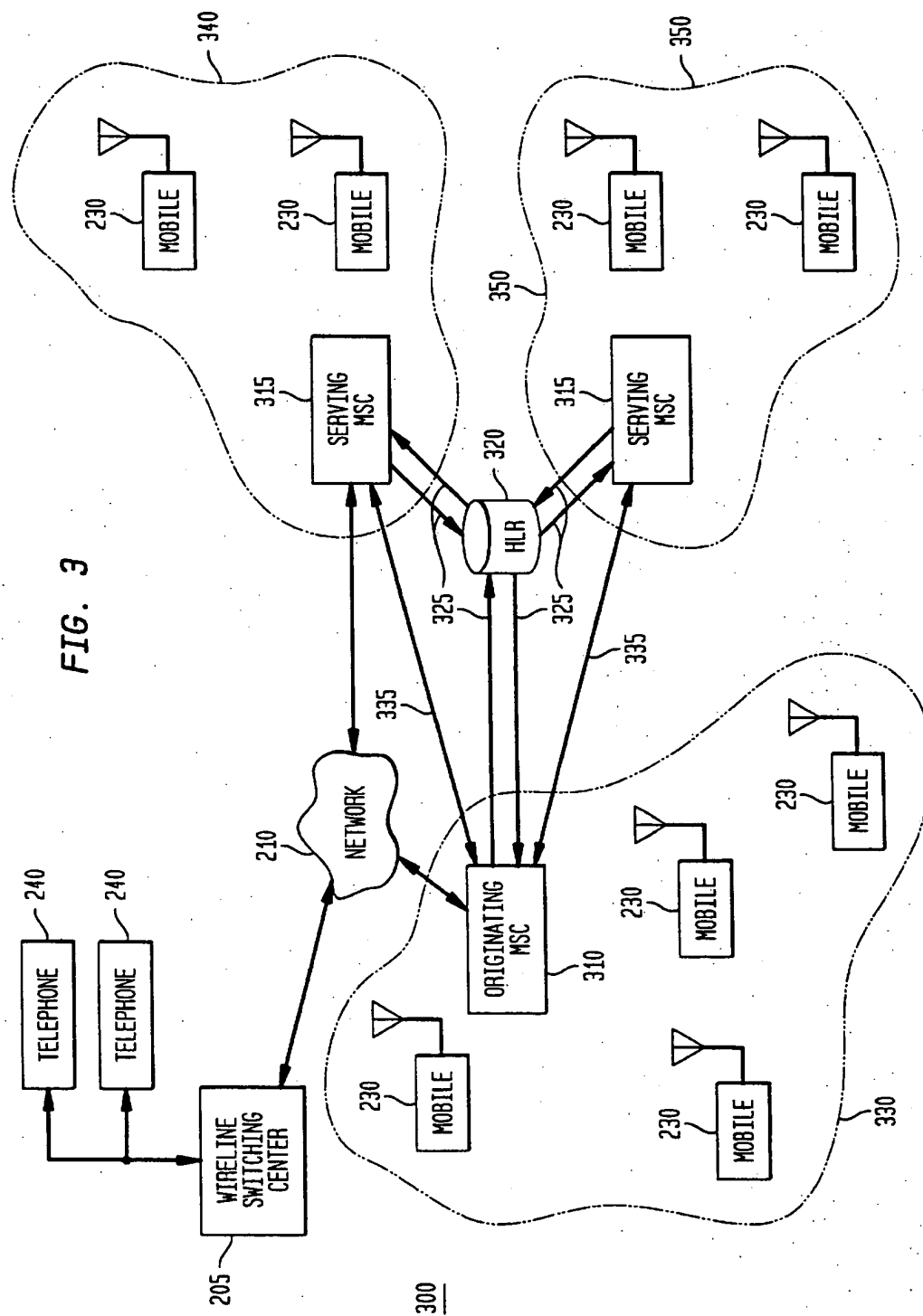


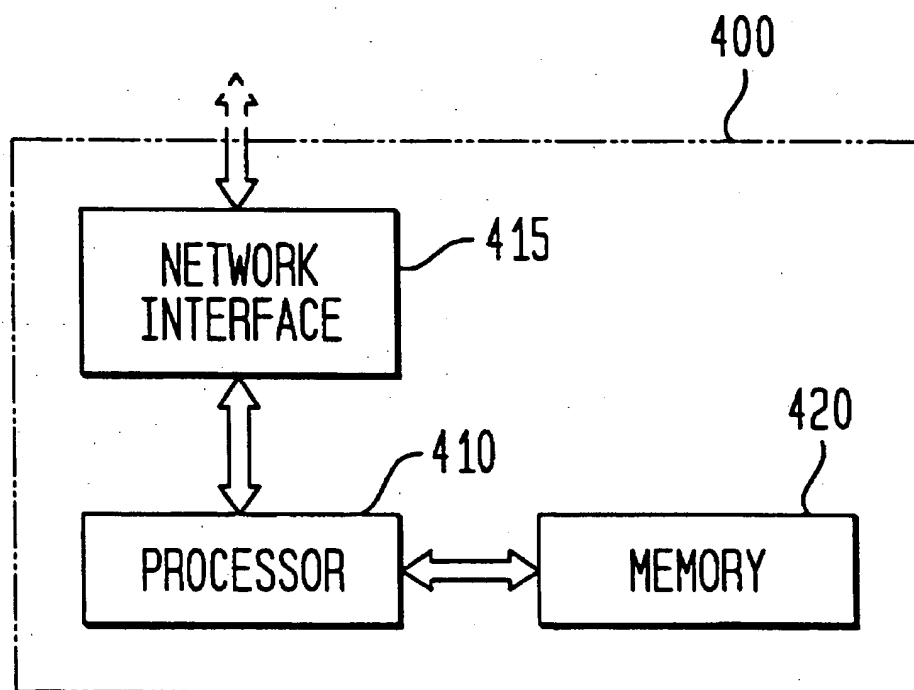
FIG. 4

FIG. 5

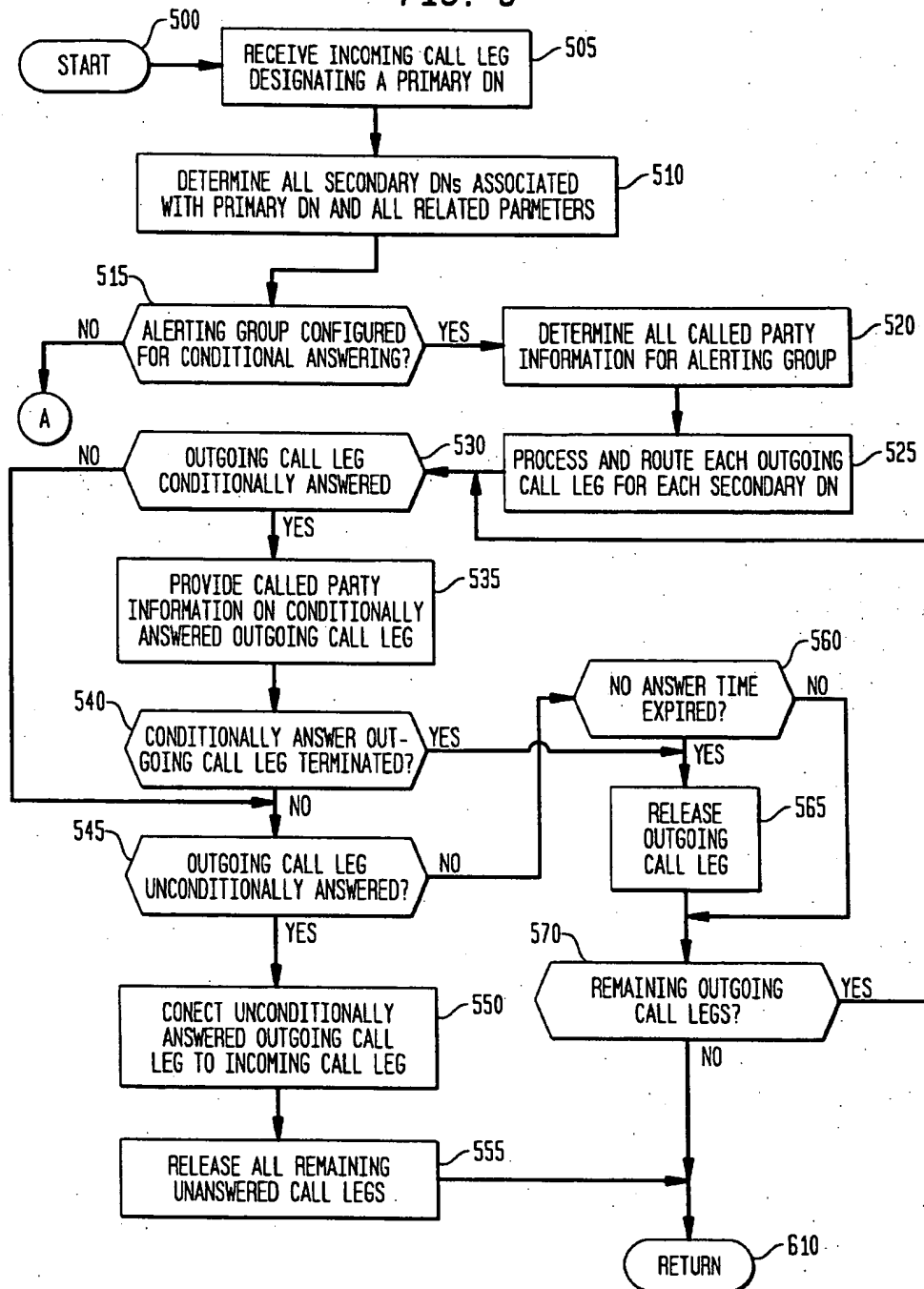
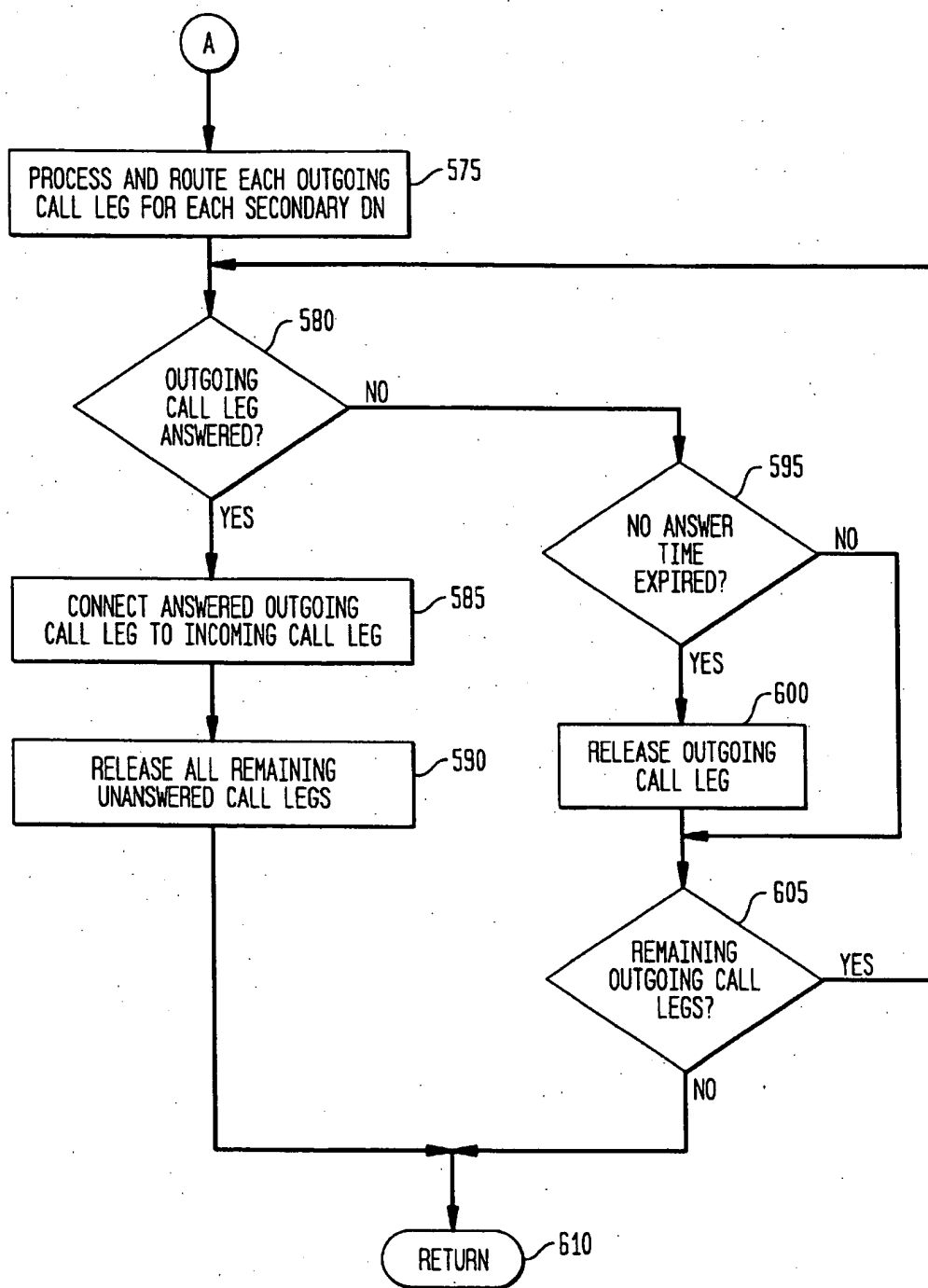


FIG. 5



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APPARATUS, METHOD AND SYSTEM FOR PROVIDING CONDITIONAL ANSWERING IN MULTIPLE LEG TELECOMMUNICATION SESSIONS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is related to Baiyor et al., U.S. Pat. No. 6,009,159, entitled "Apparatus, Method And System For Controlling The Start Of Alerting Of Multiple Leg Telecommunication Sessions", filed Jun. 15, 1998 and issued Dec. 28, 1999, commonly assigned to Lucent Technologies, Inc., and incorporated by reference herein, with priority claimed for all commonly disclosed subject matter (the "first related patent").

This application is related to Baiyor et al., U.S. Pat. No. 6,005,930, entitled "Apparatus, Method And System For Controlling Secondary Treatment By A Distant Switch Of Multiple Leg Telecommunication Sessions", filed Jun. 15, 1998 and issued Dec. 21, 1999, commonly assigned to Lucent Technologies, Inc., and incorporated by reference herein, with priority claimed for all commonly disclosed subject matter (the "second related patent").

This application is related to Baiyor et al., U.S. patent application Ser. No. 09/097,527, entitled "Apparatus, Method And System For Providing Information To A Called Party In Multiple Leg Telecommunication Sessions", filed Jun. 15, 1998, commonly assigned to Lucent Technologies, Inc., and incorporated by reference herein, with priority claimed for all commonly disclosed subject matter (the "third related application").

This application is related to Baiyor et al., U.S. patent application Ser. No. 09/342,499, entitled "Apparatus, Method And System For Providing Variable Alerting Patterns For Multiple Leg Telecommunication Sessions", filed Jun. 29, 1999, commonly assigned to Lucent Technologies, Inc., and incorporated by reference herein, with priority claimed for all commonly disclosed subject matter (the "fourth related application").

This application is related to Baiyor et al., U.S. patent application Ser. No. 09/350,577, entitled "Apparatus, Method And System For Providing Call Progress Information For Multiple Leg Telecommunication Sessions For Intelligent Network Services", filed Jul. 9, 1999, commonly assigned to Lucent Technologies, Inc., and incorporated by reference herein, with priority claimed for all commonly disclosed subject matter (the "fifth related application").

This application is related to Baiyor et al., U.S. patent application Ser. No. 09/350,439, entitled "Apparatus, Method And System For Providing Variable Termination Patterns For Multiple Leg Telecommunication Sessions", filed Jul. 9, 1999, commonly assigned to Lucent Technologies, Inc., and incorporated by reference herein, with priority claimed for all commonly disclosed subject matter (the "sixth related application").

This application is related to Baiyor et al., U.S. patent application Ser. No. 09/404,901, entitled "Apparatus, Method And System For Subscriber Control Of Timed And Regional Membership In Multiple Member Termination Groups For Multiple Leg Telecommunication Sessions", filed Sep. 24, 1999, commonly assigned to Lucent Technologies, Inc., and incorporated by reference herein, with priority claimed for all commonly disclosed subject matter (the "seventh related application").

This application is related to Baiyor et al., U.S. patent application Ser. No. 09/455,623, entitled "Apparatus,

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Method And System For Telecommunication Conferencing Services In A Multiple Leg Telecommunication Session", filed Dec. 7, 1999, commonly assigned to Lucent Technologies, Inc., and incorporated by reference herein, with priority claimed for all commonly disclosed subject matter (the "eighth related application").

FIELD OF THE INVENTION

The present invention relates in general to telecommunication systems and services, and more particularly, to an apparatus, method and system for providing conditional answering in a multiple leg telecommunication session.

BACKGROUND OF THE INVENTION

With the advent of increasingly sophisticated telecommunication services, various services and systems are currently available that provide a called party with information pertaining to an incoming call, prior to answering, resulting in a call screening capability. This call screening capability may be limited, however, due to the types of information typically provided. For example, a calling party number and calling party name service (commonly referred to as "caller ID") displays the directory number of the telephone originating the call, but does not provide any information concerning how the call was routed or what the called party directory number may have been.

Additional types of information for provision to a called party may be particularly useful for new forms of telecommunication services. One such new telecommunication service allows a single call, incoming to a telecommunication switch, to branch into multiple, independent outgoing calls (or legs) to different called parties, during the same period of time. Once such proposed service is included in the ANSI-41 specification promulgated by the American National Standards Institute for wireless telecommunication, such as cellular communication, and is referred to as "flexible alerting". In a multiple outgoing call leg service such as flexible alerting, an incoming call to a primary (or "pilot") directory number is branched into multiple outgoing call legs to secondary directory numbers (which were previously specified as part of a flexible alerting group associated with the primary directory number). The ANSI-41 flexible alerting specification, however, does not include any specific directions or guidelines for types of information to be provided to called parties in such independent, concurrent outgoing multiple leg calls.

The use of these multiple outgoing call leg telecommunication services, such as "flexible alerting", raise new issues for the provision of information to called parties. With such flexible alerting, there is a loss of a 1:1 correlation between the directory number dialed and the directory number alerted. For instance, any given telephone (i.e., directory number) may receive calls through multiple paths, such as calls made directly to its directory number (directly dialed), and calls made indirectly, through the flexible alerting group (primary directory number dialed, with subsequent routing to that given directory number). As a consequence, in screening incoming calls, a called party may want to know if his or her telephone was alerted directly, by a direct call to their directory number, or indirectly, through membership in any number of flexible alerting groups.

The provision of additional information to the called party, such as routing information or information pertaining to the purpose of the call, is significant for other purposes as well. For example, in a multiple leg telecommunication

session, additional information may allow an alerted party to refrain from answering a call, allowing other, more appropriate members of a flexible alerting group to answer the call, such as those with particular language capabilities or familiarity with specified subjects.

As a consequence, a need remains for an apparatus, method and system both provide a called party with additional information for call screening, and to allow a called party to conditionally answer an incoming call to receive the additional information. Such additional information should include call routing information, call purpose information, or other types of information designated by the consumer. Such conditional answering should also provide an alerted party with the ability to conditionally answer an incoming call, without releasing or dropping other outgoing call legs while the alerted party is receiving the additional information. In addition, such an apparatus, method and system should also be user friendly, user transparent, and capable of implementation in existing telecommunication equipment.

SUMMARY OF THE INVENTION

A system, apparatus and method provide conditional answering by a called party in multiple leg telecommunication sessions, such as in a flexible alerting service. The various embodiments of the present invention both allow a called party to conditionally answer an incoming call and provide a called party with additional types of information, enabling a significant level of call screening. In the preferred embodiment, the additional, called party information includes call routing information, call purpose information, and other types of information designated by the consumer.

The preferred system embodiment includes a home location register (HLR) coupled to a mobile switching center (MSC). In the preferred system embodiment, a MSC receives an incoming call leg designating a primary directory number ("DN"). A subscriber or other user of flexible alerting (or other multi-leg communication services) typically predefines a group of other directory numbers, referred to herein as secondary DNs, which are to be associated with the primary DN, such that when a call is placed to the primary DN, all of the secondary DNs are alerted. Such a list or grouping may be referred to as a flexible alerting group, or more broadly as an alerting group. In general, the incoming call to the primary DN is then processed and routed by a MSC, which then directs the incoming call to the multiple different mobile or wireline secondary DNs of the user's predefined alerting group, creating multiple different outgoing communication legs to these differing and independent directory numbers.

More specifically, in the preferred embodiment, when a MSC receives an incoming call leg to the primary DN, it requests call treatment instructions from the HLR, typically utilizing a location request. In accordance with the present invention, the HLR then directs the MSC to obtain "called party information" from the calling party. Typically, the MSC may provide the calling party with a menu of options, such as language selections, and choices of different kinds of products or services. In addition, the MSC may request the name of the calling party and the purpose of the call. This information may be transmitted to the HLR, while some of the information (such as the calling party name and purpose of the call) may be stored for re-transmission to a called party. Based upon this information, the HLR may select a subset of secondary DNs from the alerting group, such as those secondary DNs corresponding to called parties with fluency in a particular language or who support particular

services or products. The HLR then provides the MSC with a listing of the secondary DNs to which outgoing call legs are to be routed, and the MSC then processes and generates outgoing call legs to these secondary DNs.

The MSC further provides conditional answering of these outgoing call legs. Such a conditional answering may be configured in a variety of ways, such as by entry of a predetermined code by a called (alerted) party, such as *SEND or *TALK, or simply by going off hook. When an outgoing call leg is conditionally answered, the MSC provides the called party information on the conditionally answered outgoing call leg, but does not then connect the conditionally answered outgoing call leg to the incoming call leg to form a communication session. The called party of the conditionally answered outgoing call leg may then utilize the called party information as desired, such as to screen the call, and may then unconditionally answer, hold or release the outgoing call leg. Other outgoing call legs continue to be alerted and may also be conditionally answered, with the provision of called party information, or may remain unanswered, or may be unconditionally answered. Whichever outgoing call leg is first to be unconditionally answered will receive the call and be connected to the calling party, with the other call legs released (i.e., dropped or torn down, with their corresponding alerting ceased), including other outgoing call legs which may have been conditionally answered previously.

The various embodiments of the present invention both allow a called party to conditionally answer an incoming call and provide a called party with additional types of information, enabling a significant level of call screening. In the preferred embodiment, the additional, called party information includes call routing information, such as a specification of the primary DN called, call purpose information, and other types of information designated by the consumer. For example, the information provided to the called party may include responses from the calling party, such as option or menu selections, or may identify specific flexible alerting groups, providing the called party with information pertaining to the purpose or routing of the call, and enabling the most suitable member of a flexible alerting group to respond to the call. The various embodiments of the present invention also provide an alerted party with the ability to conditionally answer an incoming call and receive the additional information, without being connected to the calling party and without releasing or dropping other outgoing call legs to other members of the alerting group. In addition, the apparatus, method and system of the present invention are user friendly, user transparent, and capable of implementation in existing telecommunication equipment.

Numerous other advantages and features of the present invention will become readily apparent from the following detailed description of the invention and the embodiments thereof, from the claims and from the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1A is a graphical diagram illustrating alerting of multiple outgoing communication sessions commencing upon processing of an incoming call to a network switch.

FIG. 1B is a graphical diagram illustrating conditional answers during alerting of multiple outgoing communication sessions in accordance with the present invention.

FIG. 1C is a graphical diagram illustrating connection of an unconditionally answered outgoing communication call leg with an incoming call leg to form a communication

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sessions, with the release of remaining outgoing call legs, in accordance with the present invention.

FIG. 2 is a block diagram illustrating a first system embodiment for providing conditional answering in multiple leg telecommunication sessions in accordance with the present invention.

FIG. 3 is a block diagram illustrating a second system embodiment for providing conditional answering in multiple leg telecommunication sessions for wireless communication in accordance with the present invention.

FIG. 4 is a block diagram illustrating an apparatus embodiment for providing conditional answering in multiple leg telecommunication sessions in accordance with the present invention.

FIG. 5 is a flow diagram illustrating a method embodiment for providing conditional answering in multiple leg telecommunication sessions in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

While the present invention is susceptible of embodiments in many different forms, there are shown in the drawings and will be described herein in detail specific embodiments thereof, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the specific embodiments illustrated.

As mentioned above, a need remains for an apparatus, method and system both to provide a called party with additional types of information and to allow a called party to conditionally answer an incoming call. In accordance with the present invention, an apparatus, method and system are provided which both provide a called party with such additional information for call screening, and which allow a called party to conditionally answer an incoming call to receive the additional information. In the preferred embodiment, the additional information includes call routing information, call purpose information, and other types of information designated by the consumer. For example, the information provided to the called party may include responses from the calling party or may identify specific flexible alerting groups, thereby providing the called party with information pertaining to the purpose or routing of the call. The various embodiments of the present invention also provide an alerted party with the ability to conditionally answer an incoming call and receive the additional information, without being connected to the calling party and without releasing or dropping other outgoing call legs to other members of the alerting group. In addition, the apparatus, method and system of the present invention are user friendly, user transparent, and capable of implementation in existing telecommunication equipment.

As mentioned above, the new ANSI-41 specification provides a communications standard for flexible alerting for wireless communications, as a terminating feature or terminating call service. In this specification, a call is placed to a special directory number ("DN") referred to as a pilot directory number ("pilot DN") or as a primary directory number ("primary DN"). A subscriber or other user of flexible alerting or other multi-leg communications, typically predefines a group of other directory numbers, referred to herein as secondary DNs, which are to be associated with the pilot or primary DN, such that when a call is placed to the primary DN, all of the secondary DNs are alerted. Such a list or grouping may be referred to as a flexible alerting

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group, or more broadly as an alerting group or a secondary DN group. The incoming call to the pilot DN is then to be processed by a mobile switch, which then directs the incoming call to the multiple different mobile or wireline secondary DNs of the user's predefined alerting group, creating multiple different outgoing communication legs to these differing and independent directory numbers. Whichever outgoing call leg is first to answer will receive the call and be connected to the calling party, with the other call legs released (i.e., dropped or torn down, with their corresponding alerting ceased).

Such flexible alerting or other multi-leg communication may be useful, for example, in businesses involving sales, repairs, or dispatching services. Such flexible alerting may also be useful for other business and personal uses, such as multiple calls to a home, office, and cellular telephone. For example, a child may call a single DN, namely, a parent's pilot DN, which will then alert the telephones at all the associated directory numbers or lines defined in the parent's alerting group or list, such as their home DN, business office DN, home office DN, and cellular or other mobile telephone DN. Presuming the parent is present, the parent will be alerted at any and all of these locations from the placement of a single telephone call.

As a consequence, for the purposes of the present invention, a person referred to as a called party may receive telecommunication calls in at least two different ways. First, the called party may receive calls directly via incoming calls placed to their directory number. Second, if their directory number is defined as a secondary DN in an alerting group, they may receive calls indirectly via incoming calls placed to the pilot DN (or primary DN) of the alerting group. Similarly, a called party may also receive calls indirectly through call forwarding, via incoming calls placed to a different directory number of the called party. The present invention is directed to enabling the called party to conditionally answer an outgoing call leg to receive types of information to distinguish between these two types of calls, direct and indirect calls (such as flexible alerting calls), and to determine whether they are the most appropriate member (of a flexible alerting group) to unconditionally answer the incoming call leg.

Typically, when an individual answers a call, such as by going off-hook or by pressing a SEND (TALK, or equivalent) button, that call is answered "unconditionally", such that the called party is immediately connected to the calling party for a communication session. In accordance with the present invention, however, an individual may "conditionally" answer a call and receive additional information, transparently to the calling party, and without the called party being connected to the calling party for a communication session. Following a conditional answer, the called party may further decide to accept (unconditionally answer) or reject (decline to unconditionally answer) the call; in the event the called party does accept the call, then and only then is the called party connected to the calling party for a communication session.

More specifically, in accordance with the present invention, when a called party has been alerted (on an outgoing call leg of a multiple outgoing call leg session), the called party may "conditionally answer" the outgoing call leg, such as by going off hook, by pressing a "SEND" button (or its equivalents, such as a TALK button), or by entering a predesignated code, such as "**SEND" or "**3", for example. Following such a conditional answer, information is provided to the called party, such as a verbal message provided by the calling party or a designation of which

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flexible alerting group was called. During this time, other members of the flexible alerting group may also be conditionally (or unconditionally) answering their corresponding outgoing call legs. Following a conditional answer, the called party may accept (unconditionally answer) the outgoing call leg, or may release (reject) the outgoing call leg (such as by pressing an "end" button or by going on hook). Whichever outgoing call leg is first to provide an unconditional answer will receive the call and be connected to the calling party, with the other call legs released (i.e., dropped or torn down, with any corresponding alerting ceased).

The ANSI-41 specification does not address any issue concerning either conditional answering of an outgoing call leg or the provision of information to a called party pertaining to the routing or purpose of the outgoing call. Rather, the ANSI-41 specification merely addresses and requires that an incoming call to a pilot DN be routed to associated secondary DNs of the flexible alerting group, with the calling party ultimately connected to an answering party. FIG. 1A is a graphical diagram illustrating alerting of multiple outgoing communication sessions commencing upon processing of an incoming call (incoming call leg 105) to a network switch 130.

As illustrated in FIG. 1A, an incoming call leg 105 is received and processed by a network switch 130 (discussed in greater detail below). Following processing of the incoming call leg, call placement and other processing commences for four independent outgoing communication sessions A, B, C, and D, namely outgoing call legs 110, 115, 120 and 125 respectively (illustrated as dashed lines). These various outgoing call legs may be routed to any type of wireline or wireless secondary DN. Similarly, the outgoing call legs may be routed through one or more nodes, which may be any combination of PSTN (public switched telephone network), satellite, packet-based, or wireless nodes, or may require an additional mobile paging message to locate a mobile telephone. As these calls are processed, the switch 130 presumably (and with reasonable certainty) has no a priori or other advanced knowledge concerning which, if any, of the outgoing call legs 110, 115, 120 and 125 will be unconditionally answered. As a consequence, in accordance with the invention of another related patent application of Lucent Technologies, Inc., an open connection is maintained between the incoming call leg 105 and all of the outgoing call legs 110, 115, 120 and 125, unless and until one of the outgoing call legs is, in fact, unconditionally answered by a called party. Once one of the outgoing call legs 110, 115, 120 and 125 is unconditionally answered, then a voice path, connection or link will be established between the incoming call leg 105 and the unconditionally answered outgoing call leg.

FIG. 1B is a graphical diagram illustrating an exemplary conditional answering of two outgoing call legs of the flexible alerting illustrated in FIG. 1A. As illustrated in FIG. 1B, called parties A and C have conditionally answered their respective outgoing call legs 110 and 120 (illustrated by double dashed lines). In the preferred embodiment, the called party may conditionally answer their outgoing call leg in any number of predefined ways, such as by going off-hook or pressing the * button followed by the SEND button. Since the outgoing call legs 110 and 120 are only conditionally answered, an open connection continues to be maintained between all of the outgoing call legs (110, 115, 120 and 125) and the incoming call leg 105. In addition, the other outgoing call legs which have not (yet) been conditionally or unconditionally answered (outgoing call legs 115 and 125) are not being released or dropped by the network

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switch 130. Moreover, during the period that called party A is conditionally answering the outgoing call leg 110, information is being transmitted to the called party A, and during the period that called party C is conditionally answering the outgoing call leg 120, similar information is also being transmitted to the called party C.

Continuing to refer to FIG. 1B, while either called party A or called party C is receiving called party information, any one of the outgoing call legs may be unconditionally answered. For example, during or after reception of such information, called party A may decide to unconditionally answer the call, or to not answer the call. Once one of the outgoing call legs 110, 115, 120 and 125 is unconditionally answered, a connection or link is established between the incoming call leg 105 and the unconditionally answered outgoing call leg, and the other unanswered or conditionally answered outgoing call legs are released, as discussed below with reference to FIG. 1C.

FIG. 1C is a graphical diagram illustrating connection of an unconditionally answered outgoing communication call leg with an incoming call leg to form a communication sessions, with the release of remaining outgoing call legs, in accordance with the present invention. As illustrated in FIG. 1C, for example, called party C has unconditionally answered the outgoing call leg 120 (illustrated as a solid line). Consequently, a connection or link 135 is or has been established between the incoming call leg 105 and the unconditionally answered outgoing call leg 120 to form a full duplex communication session, and the other outgoing call legs 110, 115 and 125 are being or have been released or dropped (illustrated as dotted lines). While in this case outgoing call leg 120 has been the first of the outgoing call legs to provide an unconditional answer (and therefore be connected to the incoming call leg 105), it should be noted that any outgoing call leg which is first to provide an unconditional answer will be connected to the incoming call leg, not just an outgoing call leg which previously provided a conditional answer.

As mentioned above, information (referred to herein as "called party information") is provided by the switch 130 on all conditionally answered outgoing call legs, in this case outgoing call legs 110 and 120, as illustrated in FIG. 1B. Accordingly, any called party that has conditionally answered their respective outgoing call leg receives the called party information, and thereby may screen the outgoing call leg. An important aspect of the present invention is that any conditionally answered outgoing call leg (such as 110 and 120) is not, without more, connected to the incoming call leg from the calling party. As a consequence, the conditional answering occurs transparently to the calling party. Moreover, when any of the outgoing call legs (110 and 120) have been conditionally answered, the network switch 130 does not release or drop the other outgoing call legs, namely, outgoing call legs 115 and 125. Rather, such outgoing call legs are dropped or released only following an unconditional answer of an outgoing call leg, such as outgoing call leg 120 of FIG. 1C.

In the preferred embodiment, the called party information consists of an audible message for perception by a listener. For instance, when the information is a message, the message may alert the called party that the call session is a multiple leg telecommunication session. The message also may provide the called party with a distinguishing group identifier, such as an alerting group name or number, or the primary directory number called (or other designation of a flexible alerting group), in order to assist the called party in distinguishing one flexible alerting group from another, such

as distinguishing a business group from a family group. The information provided to the called party may also indicate the number of outgoing call legs which are being alerted, also to assist in determining whether the called party should unconditionally answer the outgoing call leg. For more advanced embodiments, the calling party may be asked by the system (such as systems 200 or 300, below) to provide certain types of information, such as language requirements or product requirements; this information also is then provided on outgoing call legs which have been conditionally answered.

Other information which may be useful for a called party may also be transmitted. Such information may include a notification of the language of the calling party, such as English or Spanish, to enable the most appropriate member of a flexible alerting group to respond to the call. Other types of calling party information, such as information pertaining to particular products, also may be provided that may be appropriate or useful in directing the incoming call leg to the most suitable called party. For example, information pertaining to particular products may be useful for an alerting group for sales or for repairs. This type of information may be designated when a flexible alerting group is originally established and may be modified over time. In the preferred embodiment, a menu of choices pertaining to this type of information is provided to the calling party, who may then make an appropriate choice, such as by pressing "1" for English, "2" for Spanish, or pressing "3" for cellular and "4" for PCS.

As indicated above, various options are available to the called party for providing a conditional answer (and screening incoming calls) and/or providing an unconditional answer. In the preferred embodiment, the called party may provide an encoded conditional answer that includes screening capability. For example, for a called party who is a member of several alerting groups, upon being alerted, the called party may enter a "*3" or a "3SEND", providing a conditional answer indicating that the called party is to be connected to a call only from their alerting group number 3. Similarly, the called party may enter a "#3" or similar code for a negative conditional answer and screening, indicating that the called party is to be connected to a call only from any alerting group other than their alerting group number 3. When any of these conditions is met, the called party does not need to perform any further actions to be connected to the incoming call leg.

In addition to output of an audible message, other means such as visual displays (on mobile units 130, discussed below) may also provide the called party with the ability to screen calls. First, in addition to caller ID display, additional information such as a "*" (star), a "#" (pound), a special digit sequence (such as "99"), or any other distinctive identifier or other mark, may be added as a prefix or suffix to a displayed calling number and/or name in order to designate a flexible alerting call. In addition, the called directory number could also be displayed, indicating to the called party whether the outgoing call leg was a flexible alerting call (displaying the pilot or primary DN), or whether the call was a direct call (displaying the called party's directory number).

FIG. 2 is a block diagram illustrating a first system embodiment 200 in accordance with the present invention. The system 200 includes one or more mobile switching centers ("MSCs") 215 and one or more wireline switching centers 205, which may be connected via trunk and signaling lines to each other and to a broader network 210, such as a PSTN or ISDN network, thereby providing multiple tele-

communication connections to other locations, such as providing a link to a satellite 235. The system 200 also includes a database 220, which is preferably connected or coupled to a wireline switching center 205 and to the MSC 215. A database 220 may also be directly included or integrated within the various switching centers 205 and 215.

The wireline switching center 205 is generally connected to a plurality of telephones 240 or other customer premise equipment. Alternatively, via base stations or other wireless transceivers (not separately illustrated), the MSCs 215 typically have a wireless link to the various mobile units 230, such as cellular telephones within a particular geographic region. The wireline and mobile switching centers 205 and 215 usually are also typically physically separated due to regulatory and other historical reasons. These switching centers, however, may be combined into one or more switching centers having both wireline and wireless functionalities.

Continuing to refer to FIG. 2, either the wireline switching center 205 or one of the mobile switching centers 215 receives an incoming call directed to a primary DN. The switching center 205 or 215 then transmits a request to database 220 for an alerting list containing the secondary DNs associated with the primary or pilot DN (such as a termination list). The database 220 transmits a response to the corresponding switching center 205 or 215. The response may contain or list the associated DNs and any corresponding routing and timing parameters (disclosed in the related applications), or may request that the switch obtain additional information from the calling party.

For example, in response to a request from a switching center 205 or 215, the database 220 may provide the switch with an announcement list, for options to be played to the calling party, as previously specified in creating (or modifying) the particular alerting group. When announcement messages have been played, the calling party then enters associated choices, such as language choices (e.g., pressing "1" for English, "2" for Spanish), or other service or equipment choices (e.g., pressing "1" for cellular services, "2" for wireline services, "3" for data services, and so on). In addition, the calling party may also be requested to speak his or her name, or company, etc. This responsive information is then transmitted by the switch (205 or 215) to the database 220. Based on this responsive information, the database 220 may then make various determinations (based upon the calling party's input) and generate an appropriate listing of secondary DNs (selected as a subset from the available secondary DNs of the total alerting group), such as the secondary DNs of those alerting group members who are fluent in Spanish. The database 220 then transmits (to the switching center 205 or 215) this listing of secondary DNs (with associated routing and timing parameters, and with any further information to be transmitted to the called parties), for corresponding routing and conditional answering of the outgoing call legs.

For conditional answering, the system 200 may be configured in various ways. In a first embodiment, the system is pre-configured for conditional answering, such that entry of pre-established code or pressing a particular key by the called party is automatically interpreted as a conditional answer, such as entry of a "3SEND" when answering (with entry of "SEND" interpreted as an unconditional answer). In an alternative embodiment of the present invention, the system 200 is configured for unconditional answering (as a default). To provide conditional answering, a new parameter may be included one of the response messages from the database 220 to the switch (205 or 215), which indicates that

the outgoing call legs may be conditionally answered (referred to herein as a conditional answering ("CA") parameter). In that alternative embodiment, the absence of the conditional answering parameter in the response message is a default setting indicating normal or typical handling of answered outgoing call legs (i.e., any answer is an unconditional answer).

As indicated above, following routing of the various outgoing call legs by the switch (205 or 215) and alerting of the various called parties, in accordance with the present invention, any of the outgoing call legs may be conditionally answered, with the called party receiving any of the various types of called party information discussed above. Following reception of such information, a conditionally answering called party may then unconditionally answer the outgoing call leg, or may release the outgoing call leg. Alternatively, with or without a conditional answer, any of the outgoing call legs may also be unconditionally answered. As mentioned above, any such unconditionally answered outgoing call leg is connected to the incoming call leg, for a communication session with the calling party, with all remaining outgoing call legs then being released or torn down.

FIG. 3 is a block diagram illustrating a second, preferred system embodiment 300 for wireless communication in accordance with the present invention, such as for ANSI-41 flexible alerting. In this system 300, two types of MSCs represent the mobile switching centers 215. The first type of MSC, referred to as an originating MSC 310, receives an incoming call leg designating a primary DN, generates the plurality of outgoing call legs to the associated secondary DNs, and directly provides service to the mobile units 230 within its designated or predetermined geographic region 330. The second type of MSC, referred to as a serving MSC 315, provides service to mobile units 230 that have traveled or roamed into their designated or predetermined geographic regions 340 and 350. A stand-alone home location register ("HLR") 320 is illustrated, to implement the database 220 and other ANSI-41 signaling functionality. (Alternatively, an integrated HLR may also be utilized, in which HLR functionality is included within each MSC 310 and 315.) The various MSCs 310 and 315 are preferably connected to the HLR 320 via ANSI-41 signaling interfaces and corresponding links 325. As in the system of FIG. 2, the various MSCs 310 and 315 are also connected or coupled to a wireline switching center 205 and to a network 210, for multiple network connections, such as PSTN, ISDN, or satellite connections. (As in FIG. 2, base stations or other wireless transceivers are not separately illustrated).

Referring to FIG. 3, when an originating MSC 310 receives an incoming call designating a primary DN, the originating MSC 310 transmits a query or other message to an HLR 320. Such a query is typically in the form of a data packet, and includes a reference to the pilot DN or other primary DN. While the operation of the system 300 is explained with reference to an originating MSC 310, it should be understood that any MSC 215, at any given time, may be serving as either or both an originating MSC 310 or a serving MSC 315. The incoming call to the originating MSC 310 may be a wireless call from one of the mobile units 230 or may be a wireline call originating from the network 210, such as a PSTN call. In the preferred embodiment, utilizing the ANSI-41 specification, the query transmitted by the originating MSC 310 to the HLR 320 is a "LocationRequest", which is an operation used by an originating MSC 310 to obtain call treatment instructions from the HLR 320. The location request or query is initiated with a "TCAP INVOKE (LAST)", carried by a TCAP QUERY

WITH PERMISSION package, and includes corresponding mandatory and optional parameters as defined in the ANSI-41 specification for a LocationRequest INVOKE, such as pilot DN, billing identification, and originating MSC identifier.

Utilizing its database, the HLR 320 first determines whether the primary DN is for a flexible alerting group (or other multi-leg communications group), and if so, the HLR 320 prepares a response or other message for transmission to the originating MSC 310. As mentioned above, if the HLR 320 is configured to obtain or request more information (from the calling party, via the MSC 310), the HLR 320 prepares and transmits a response message, indicating the type of information to be collected, as discussed above. In the preferred embodiment, the response message is an ANSI-41 compatible RemoteUserInteractionDirective with an AnnouncementList. This response message directs the originating MSC 310 to output or play the various designated prompts or other messages to the calling party, and to obtain the requested information, such as touch tone (DTMF) responses or a recording of a calling party name. The information collected by the originating MSC 310 is transmitted to the HLR 320, preferably in the form of an ANSI-41 compatible RemoteInteractionDirective with DialedDigits. Based upon this information and its configuration for the particular alerting group, the HLR 320 then determines what information should be included in a response, including a listing of selected secondary DNs, appropriate routing and timing parameters, a conditional answer parameter (to indicate that the alerting group should be provided with this service, also as discussed above), and other called party information to be provided on the outgoing call legs.

Following this determination, or following a location request when the HLR 320 does not request additional information from the originating MSC 310, the HLR 320 generates a message (for transmission to the originating MSC 310) containing or listing the selected secondary DNs that are to be alerted, and containing some or all of the called party information, such as text for display. In the preferred embodiment, the response data packet listing the secondary DNs is provided in a TerminationList of an ANSI-41 compatible LocationRequest RETURN RESULT ("LRRR"). In addition, depending upon system 300 configuration, as mentioned above, the HLR 320 may also include within the response message a conditional answer parameter, to provide this service for the flexible alerting session. As disclosed in the related applications, the HLR 320 may also have obtained routing information for roaming mobile units 230, and if so, additional messaging may have occurred between the HLR 320 and the serving MSCs.

The originating MSC 310, utilizing the data contained in the response data packet (the secondary DNs, their corresponding routing parameters, called party information, and optionally a conditional answer parameter, included within an LRRR), begins processing and routing each outgoing call leg to each secondary DN. If and when one or more of these outgoing call legs is conditionally answered, by going off-hook or entering a predesignated code such as *SEND, the originating MSC 310 transmits called party information to the called party on each of the conditionally answered outgoing call leg(s), and maintains an open connection between the incoming call leg and the conditionally answered outgoing call leg(s). During this time, other outgoing call legs may be conditionally or unconditionally answered, and any unanswered outgoing call legs may also be released or dropped according to their respective no answer time parameters ("NAT").

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A called party of one of the conditionally answered outgoing call legs, having received the called party information, may subsequently decide whether to unconditionally answer the call leg or to release the call leg. In addition, any of the called parties of the other outgoing call legs may also decide to unconditionally answer their respective outgoing call leg. Whichever called party is first to unconditionally answer an outgoing call leg, such as by entering a code or pressing the "SEND" button, that outgoing call leg is connected to the incoming call leg by the MSC 310, and the other remaining outgoing call leg are released or dropped (also by the MSC 310). Conversely, for any conditionally answered outgoing call leg, in the event that the called party does not want to unconditionally answer, the called party may simply go on-hook or press an "END" button. The MSC 310 then releases that outgoing call leg, all transparently to the calling party.

In the preferred embodiment, the outgoing call leg is conditionally answered by entering a code, such as by pressing the * button followed by the SEND button (i.e., *SEND). As mentioned above, other alternatives are available, for instance, for utilizing different screening options, such as off-hook providing an unconditional answer, *SEND providing a conditional answer, and various positive or negative screening alternatives for different alerting groups, such as 3SEND to provide a conditional answer for the user's predefined flexible alerting group number three, or 2SEND to provide a conditional answer for all of the user's predefined flexible alerting groups except number 2.

FIG. 4 is a block diagram illustrating an apparatus embodiment 400 in accordance with the present invention. As discussed in greater detail below, the apparatus 400 may be included within an MSC (310 or 315), or distributed among an MSC (310 or 315) and HLR 320 of a system 300, or may be included within a switch 205 or 215, or distributed among a switching center 205 or 215 and database 220 of system 200. The apparatus 400 includes a network interface 415, a processor 410, and a memory 420.

The network interface 415 is utilized to receive an incoming call leg to a pilot DN or primary DN, and to transmit the plurality of outgoing call legs to the secondary DNs associated with a primary DN. For example, in system 300, the network interface 415 may be couplable to the network 210 (via trunk and signaling lines) for transmission and reception of PSTN calls. The network interface 415 may also be couplable (via trunk and signaling lines) to a base station (not illustrated) for transmission and reception of wireless calls. The network interface 415 may also be utilized to receive and transmit messages, such as to receive and transmit a location request or query, and to receive and transmit a response message containing a listing of secondary DNs, called party information, and a conditional answer parameter (if any).

The memory 420 is used to store data pertaining to primary DNs, associated secondary DNs, any various subgroups of the secondary DNs (such as those pertinent to language preferences, etc.), routing parameters, answering parameters, a conditional answer parameter, other call placement and routing information, and the call progress information of the related inventions. The memory 420 may be a magnetic hard drive, an optical storage device, an integrated circuit, or any other type of data storage apparatus. The memory 420 also performs such information storage comparable to the information storage of the database 220 or HLR 320.

Continuing to refer to FIG. 4, the processor 410 may include a single integrated circuit ("IC"), or may include a

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plurality of integrated circuits or other components connected, arranged or grouped together, such as microprocessors, digital signal processors ("DSPs"), application specific integrated circuits ("ASICs"), field programmable gate arrays ("FPGAs"), associated memory (such as RAM and ROM), and other ICs and components. As a consequence, as used herein, the term processor should be understood to equivalently mean and include a single processor, or arrangement of processors, microprocessors, controllers, or some other grouping of integrated circuits which perform the functions discussed above and also discussed in detail below with reference to FIG. 5, with associated memory, such as microprocessor memory or additional RAM, SRAM, DRAM, MRAM, ROM, EPROM or E²PROM. The methodology of the invention, as discussed above with reference to FIGS. 1-3 and as discussed below with reference to FIG. 5, may be programmed and stored, in the processor 420 with its associated memory and other equivalent components, as a set of instructions (or other configuration) for subsequent execution when the processor 410 is operative (i.e., powered on and functioning).

As mentioned above, such an apparatus 400 may be included within, or distributed among, an MSC (310 or 315) or HLR 320 of a system 300, or may be included within, or distributed among, switching centers 205 or 215 and database 220 of system 200. For example, when included within the system 200, the various switching centers 205 and 215 may incorporate the database 220; in that event, the apparatus 400 may be completely included within either the wireline switching center 205 or the wireless switching center 215. Also for example, when included within the system 300, the apparatus 400 may be distributed among the originating MSC 310 and the HLR 320, with the memory 420 incorporated within the HLR 320, with the processor 410 having components within the originating MSC 310 and the HLR 320, and with the network interface 415 incorporated within the MSC 310 (or 315). In such a distributed embodiment for the system 300, the apparatus 400 would also include corresponding ANSI-41 signaling interfaces within the originating MSC 310 and the HLR 320, for communication of the various requests and responses discussed above.

FIG. 5 is a flow diagram illustrating a method embodiment for providing conditional answering in multiple leg telecommunication sessions in accordance with the present invention. The method begins, start step 500, with the reception of an incoming call leg designating a primary DN, step 505, such as reception by an MSC (310 or 315) of an incoming call leg designating a pilot DN of the ANSI-41 specification. Next, in step 510, the method determines all of the secondary DNs associated with the primary DN (as part of the alerting group) and all related parameters, such as determines whether the alerting group (and/or primary DN) is configured for conditional answering, as well as determining any timing, routing and/or no answer time parameters (as disclosed in the related applications). As indicated above, step 510 is usually performed by an HLR 320 in the preferred embodiment, following a query from the originating MSC 310 to the HLR 320, such as an ANSI-41 LocationRequest.

Following step 510, the method determines whether the multiple leg telecommunication session is configured for conditional answering, step 515, such as whether the alerting group parameters include a conditional answer parameter. When the multiple leg telecommunication session is not configured for conditional answering in step 515, the

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method proceeds to step 575 and processes the multiple leg telecommunication session according to its default or other designated mode, such as the default processing mode discussed in greater detail below (with respect to steps 575 through 605). When the multiple leg telecommunication session is configured for conditional answering (step 515) the method proceeds to step 520, and determines or obtains any and all called party information for the alerting group. As discussed above, this step is preferably performed as several substeps, with corresponding messaging, by and between the HLR 320 and MSC 310, with interaction with and input from the calling party, such as through responses to prompts or recorded verbal responses.

Following step 520, the method processes and routes each outgoing call leg, of the plurality of outgoing call legs, corresponding to each of the secondary DNs of the alerting group, step 525. In the preferred embodiment, such processing also preferably utilizes the various timing, routing and no answer time parameters of the related applications. The method then monitors each of the outgoing call legs to determine whether a call leg has been conditionally answered, step 530. When an outgoing call leg has been conditionally answered in step 530, such as by entering a code or sequence such as *TALK or #SEND, the method proceeds to step 535 and provides called party information to the called party on the conditionally answered outgoing call leg. For example, depending upon the configuration of the alerting group specified by the subscriber, an MSC 310 will provide called party information such as the primary DN called, the total number of outgoing call legs alerted, distinguishing information (such as a distinctive identifier of the alerting group), or other information requested from the calling party, as discussed above. As discussed above, for a conditionally answered outgoing call leg, no connection or communication link is created between the incoming call leg and the conditionally answered outgoing call leg. Following step 535, the method determines whether the called party of the conditionally answered outgoing call leg has terminated (or released) the call, step 540, such as by the called party going on hook, pressing an "END" button, or otherwise hanging up the call. When the conditionally answered call has been terminated in step 540, the method proceeds to step 565 and releases that outgoing call leg. When the conditionally answered outgoing call leg has not been released in step 540, or when the outgoing call leg was not conditionally answered in step 530, the method proceeds to step 545.

In step 545, the method determines whether the outgoing call leg was unconditionally answered, such as by pressing a button or entering a code (e.g., TALK or SEND). When the outgoing call leg has been unconditionally answered in step 545, the method (via MSC 310) connects the unconditionally answered outgoing call leg to the incoming call leg to form a communication session, step 550. Following this creation of a communication session, the method releases all remaining outgoing call legs, step 555, and the method may end, return step 610.

When the outgoing call leg has not been unconditionally answered in step 545, the method (via MSC 310) determines whether a no answer time period has expired, step 560, as disclosed in the related applications. When the no answer time period has expired for the (unanswered) outgoing call leg in step 560, that unanswered outgoing call leg is released, step 565. When the no answer time period has not expired for the (unanswered) outgoing call leg in step 560, and following step 565, the method determines whether there are remaining outgoing call legs to be monitored, step 570. When there are remaining outgoing call legs to be

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monitored in step 570, the method returns to step 530 and monitors each remaining outgoing call leg (for conditional answering, unconditional answering, and/or termination). When there are no remaining outgoing call legs to be monitored in step 570, the method also may end, return step 610.

As mentioned above, when an alerting group has not been configured for conditional answering (as determined in step 515), the method will provide default processing for the multiple leg telecommunication session, such as the default processing of step 575 through 605. In the preferred embodiment, such default (or regular) processing is quite similar to the processing discussed above, but without the additional conditional answering features. In step 575, for the default mode, the method also processes and routes each outgoing call leg, of the plurality of outgoing call legs, corresponding to each of the secondary DNs of the alerting group. In the preferred embodiment, such processing also preferably utilizes the various timing, routing and no answer time parameters of the related applications.

Without providing conditional answering, in step 580, the method determines whether the outgoing call leg was answered (i.e., unconditionally answered), such as by pressing a button or entering a code (e.g., TALK or SEND). When the outgoing call leg has been answered in step 580, the method (via MSC 310) connects the answered outgoing call leg to the incoming call leg to form a communication session, step 585. Following this creation of a communication session, the method also releases all remaining outgoing call legs, step 590, and the method may end, return step 610.

When the outgoing call leg has not been answered in step 580, the method (via MSC 310) also determines whether a no answer time period has expired, step 595, as disclosed in the related applications. When the no answer time period has expired for the (unanswered) outgoing call leg in step 595, that unanswered outgoing call leg is released, step 600. When the no answer time period has not expired for the (unanswered) outgoing call leg in step 595, and following step 600, the method also determines whether there are remaining outgoing call legs to be monitored, step 605. When there are remaining outgoing call legs to be monitored in step 605, the method returns to step 580 and monitors each remaining outgoing call leg for answering. When there are no remaining outgoing call legs to be monitored in step 605, the method also may end, return step 610.

In addition to the methodology illustrated in FIG. 5, other equivalent variations are available. For example, rather than specifying a single conditional answer state or parameter for the entire alerting group as a whole, each secondary DN may be configured individually for conditional answering, such as having an individual conditional answer parameter. An alerting group would then have a corresponding set of conditional answer parameters, with processing and routing of outgoing call legs potentially proceeding along both the conditional answering path (steps 515 through 570) and the default path (steps 575 through 605) discussed above. A corresponding methodology for call processing will be apparent to those of skill in the art. For example, for that situation, the method would determine whether the particular secondary DN were configured for conditional answering. When not configured for conditional answering, the corresponding outgoing call leg would be handled in a default mode, such that when answered, the answered outgoing call leg would be connected to the incoming call leg, with the release of the remaining unanswered call legs. When the secondary DN is configured for conditional answering, called party information would also be obtained

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and provided on a conditionally answered call leg, with the balance of the call processing proceeding as described above.

Numerous advantages of the present invention may be apparent from the above discussion. First, the apparatus, method and system of the present invention both allow a called party to conditionally answer an incoming call and provide a called party with additional types of information, enabling a significant level of call screening. In the preferred embodiment, the additional, called party information includes call routing information, call purpose information, and other types of information designated by the consumer. For example, the information provided to the called party may include responses from the calling party, such as option or menu selections, or may identify specific flexible alerting groups, providing the called party with information pertaining to the purpose or routing of the call. The various embodiments of the present invention also provide an alerted party with the ability to conditionally answer an incoming call and receive the additional information, without being connected to the calling party and without releasing or dropping other outgoing call legs to other members of the alerting group. In addition, the apparatus, method and system of the present invention are user friendly, user transparent, and capable of implementation in existing telecommunication equipment.

From the foregoing, it will be observed that numerous variations and modifications may be effected without departing from the spirit and scope of the novel concept of the invention. It is to be understood that no limitation with respect to the specific methods and apparatus illustrated herein is intended or should be inferred. It is, of course, intended to cover by the appended claims all such modifications as fall within the scope of the claims.

We claim:

1. A method of providing conditional answering in a multiple leg telecommunication session, the method comprising:

- (a) receiving an incoming call leg designating a primary directory number;
- (b) determining a plurality of secondary directory numbers associated with the primary directory number;
- (c) processing and routing each outgoing call leg associated with each secondary directory number, of the plurality of secondary directory numbers;
- (d) when an outgoing call leg, of the plurality of outgoing call legs, has been conditionally answered, providing called party information on the conditionally answered outgoing call leg; and
- (e) when an outgoing call leg, of the plurality of outgoing call legs, has been unconditionally answered, providing a connection between the unconditionally answered outgoing call leg and the incoming call leg to form a communication session.

2. The method of claim 1, wherein step (b) further comprises:

determining the called party information.

3. The method of claim 2, further comprising:

providing a listing of a plurality of options to a calling party;

in response, receiving an option selection from the calling party; and

based upon the option selection, determining the called party information.

4. The method of claim 3, wherein the plurality of options includes a language selection.

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5. The method of claim 3, wherein the plurality of options includes a service selection.

6. The method of claim 3, wherein the plurality of options includes a product selection.

7. The method of claim 3, wherein the plurality of options are designated in an ANSI-41 compatible Announcement List.

8. The method of claim 2, further comprising:

providing a listing of a plurality of options to a calling party;

in response, receiving an option selection from the calling party; and

based upon the option selection, determining the plurality of secondary directory numbers.

9. The method of claim 2, further comprising:

requesting a name from a calling party;

storing in a memory a calling party name received in response; and

including the calling party name in the called party information.

10. The method of claim 1, wherein a conditional answering is indicated by entry of a predetermined code on an outgoing call leg of the plurality of outgoing call legs.

11. The method of claim 1, wherein a conditional answering is indicated by an off hook signal on an outgoing call leg of the plurality of outgoing call legs.

12. The method of claim 1, further comprising:

when a conditionally answered outgoing call leg has not provided an unconditional answer within a predetermined period of time, releasing the conditionally answered outgoing call leg.

13. The method of claim 1, further comprising:

subsequent to the formation of the communication session, releasing all remaining outgoing call legs of the plurality of outgoing call legs.

14. The method of claim 1, wherein the called party information includes the primary directory number.

15. The method of claim 1, wherein the called party information includes a distinctive identifier for the multiple leg telecommunication session.

16. The method of claim 1, wherein the called party information includes an indication of an amount of outgoing call legs in the plurality of outgoing call legs.

17. A system for providing conditional answering in a multiple leg telecommunication session, the system comprising:

a database, the database having stored in a memory a plurality of secondary directory numbers associated with a primary directory number; and

a switching center coupled to the database, the switching center having an interface for receiving an incoming call leg designating the primary directory number and for processing and routing each outgoing call leg associated with each secondary directory number, of the plurality of secondary directory numbers; the switching center further providing, when an outgoing call leg of the plurality of outgoing call legs has been conditionally answered, called party information on the conditionally answered outgoing call leg; and the switching center further providing, when an outgoing call leg of the plurality of outgoing call legs has been unconditionally answered, a connection between the unconditionally answered outgoing call leg and the incoming call leg to form a communication session.

18. The system of claim 17, wherein the database determines the called party information.

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19. The system of claim 17, wherein the switching center further provides a listing of a plurality of options to a calling party, and in response, receives an option selection from the calling party; and wherein the database, based upon the option selection, determines the called party information. 5

20. The system of claim 19, wherein the plurality of options includes a language selection.

21. The system of claim 19, wherein the plurality of options includes a service selection.

22. The system of claim 19, wherein the plurality of options includes a product selection. 10

23. The system of claim 19, wherein the plurality of options are designated in an ANSI-41 compatible Announcement List transmitted from the database to the switching center.

24. The system of claim 17, wherein the switching center further provides a listing of a plurality of options to a calling party, and in response, receives an option selection from the calling party; and wherein the database, based upon the option selection, determines the plurality of secondary directory numbers. 15

25. The system of claim 17, wherein the switching center further requests a name from a calling party, stores in a memory a calling party name received in response, and includes the calling party name in the called party information. 20

26. The system of claim 17, wherein a conditional answering is indicated by entry of a predetermined code on an outgoing call leg of the plurality of outgoing call legs.

27. The system of claim 17, wherein a conditional answering is indicated by an off hook signal on an outgoing call leg of the plurality of outgoing call legs. 25

28. The system of claim 17, wherein the switching center, when a conditionally answered outgoing call leg has not provided an unconditional answer within a predetermined period of time, releases the conditionally answered outgoing call leg. 30

29. The system of claim 17, wherein the switching center, subsequent to the formation of the communication session, releases all remaining outgoing call legs of the plurality of outgoing call legs. 35

30. The system of claim 17, wherein the called party information includes the primary directory number. 40

31. The system of claim 17, wherein the called party information includes a distinctive identifier for the multiple leg telecommunication session. 45

32. The system of claim 17, wherein the called party information includes an indication of an amount of outgoing call legs in the plurality of outgoing call legs.

33. The system of claim 17, wherein the switching center is a mobile switching center and the database is a home location register. 50

34. An apparatus for providing conditional answering in a multiple leg telecommunication session, the apparatus comprising:

- a network interface for reception of an incoming call leg designating a primary directory number and for transmission of a plurality of outgoing call legs;

- a memory having a plurality of secondary directory numbers associated with the primary directory number; and

- a processor coupled to the memory and the network interface, wherein the processor, when operative, includes instructions to process and route each outgoing call leg associated with each secondary directory number, of the plurality of secondary directory numbers; the processor including further instructions, when 65

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an outgoing call leg of the plurality of outgoing call legs has been conditionally answered, to provide called party information on the conditionally answered outgoing call leg; and the processor including further instructions, when an outgoing call leg of the plurality of outgoing call legs has been unconditionally answered, to provide a connection between the unconditionally answered outgoing call leg and the incoming call leg to form a communication session.

35. The apparatus of claim 34, wherein the processor determines the called party information.

36. The apparatus of claim 35, wherein the processor includes further instructions to provide a listing of a plurality of options to a calling party, and in response, to receive an option selection from the calling party, and based upon the option selection, to determine the called party information.

37. The apparatus of claim 36, wherein the plurality of options includes a language selection.

38. The apparatus of claim 36, wherein the plurality of options includes a service selection. 20

39. The apparatus of claim 36, wherein the plurality of options includes a product selection.

40. The apparatus of claim 36, wherein the plurality of options are designated in an ANSI-41 compatible Announcement List transferred from the memory to the processor. 25

41. The apparatus of claim 35, wherein the processor includes further instructions to provide a listing of a plurality of options to a calling party, and in response, to receive an option selection from the calling party, and based upon the option selection, to determine the plurality of secondary directory numbers.

42. The apparatus of claim 35, wherein the processor includes further instructions to request a name from a calling party, to store in the memory a calling party name received in response, and to include the calling party name in the called party information. 35

43. The apparatus of claim 34, wherein a conditional answering is indicated by entry of a predetermined code on an outgoing call leg of the plurality of outgoing call legs. 40

44. The apparatus of claim 34, wherein a conditional answering is indicated by an off hook signal on an outgoing call leg of the plurality of outgoing call legs.

45. The apparatus of claim 34, wherein the processor includes further instructions, when a conditionally answered outgoing call leg has not provided an unconditional answer within a predetermined period of time, to release the conditionally answered outgoing call leg. 45

46. The apparatus of claim 34, wherein the processor includes further instructions, subsequent to the formation of the communication session, to release all remaining outgoing call legs of the plurality of outgoing call legs.

47. The apparatus of claim 34, wherein the called party information includes the primary directory number.

48. The apparatus of claim 34, wherein the called party information includes a distinctive identifier for the multiple leg telecommunication session. 55

49. The apparatus of claim 34, wherein the called party information includes an indication of an amount of outgoing call legs in the plurality of outgoing call legs.

50. A system for providing conditional answering in a multiple leg telecommunication session, the system comprising:

- a home location register, the home location register having stored in a memory, in association with a pilot directory number, a plurality of secondary directory numbers and instructions for determining called party information; and

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a mobile switching center coupled to the home location register, the mobile switching center having an interface for receiving an incoming call leg designating the pilot directory number and for processing and routing each outgoing call leg associated with each secondary directory number, of the plurality of secondary directory numbers; the mobile switching center, following reception of a directive from the home location register, obtaining information from a calling party for a determination of called party information; the mobile switching center further providing, when an outgoing call leg of the plurality of outgoing call legs has been conditionally answered, called party information on the conditionally answered outgoing call leg; and the mobile switching center further providing, when an outgoing call leg of the plurality of outgoing call legs has been unconditionally answered, a connection between the unconditionally answered outgoing call leg and the incoming call leg to form a communication session.

51. The system of claim 50, wherein the directive to the mobile switching center from the home location register is an ANSI-41 compatible AnnouncementList designating a plurality of options, and wherein the mobile switching center further provides a listing of the plurality of options to the calling party, and in response, receives an option selection from the calling party and transmits the option selection

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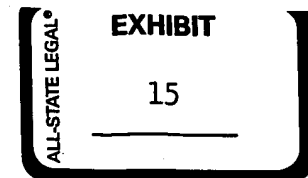
to the home location register, and wherein the home location register, based upon the option selection, determines the called party information.

52. The system of claim 50, wherein the directive to the mobile switching center from the home location register is an ANSI-41 compatible AnnouncementList designating a plurality of options, and wherein the mobile switching center further provides a listing of the plurality of options to the calling party, and in response, receives an option selection from the calling party and transmits the option selection to the home location register; and wherein the home location register, based upon the option selection, determines the plurality of secondary directory numbers.

53. The system of claim 50, wherein the plurality of options are predesignated by a subscriber from a set of selections, the set of selections including a language selection, a service selection, and a product selection.

54. The system of claim 50, wherein a plurality of types of information forming called party information are predesignated by a subscriber from a set of types of information, the set of types of information including calling party name information, the pilot directory number, a distinctive identifier for the multiple leg telecommunication session, and an indication of an amount of outgoing call legs in the plurality of outgoing call legs.

* * * * *



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF : Calabrese, et al.
FOR : **APPARATUS, METHOD AND SYSTEM
FOR MAINTAINING CALL CONTROL
AT A GATEWAY MOBILE SWITCHING
CENTER UTILIZING A PACKET
NETWORK**
SERIAL NO. : 09/558,613
FILED : April 26, 2000
EXAMINER : Rasha S. Al Aubaidi
ART UNIT : 2642
CONFIRMATION NO. : 9462
ATTORNEY DOCKET NO. : LUTZ 2 00133
Case Name/No. Calabrese 10-3-7-16

**DECLARATION OF ATTORNEY ALAN C. BRANDT
IN SUPPORT OF PETITION TO ESTABLISH PRIOR RECEIPT
IN THE PATENT AND TRADEMARK OFFICE OF ITEM APPARENTLY
CONSIDERED OMITTED BY THE PATENT AND TRADEMARK OFFICE**

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

I, Alan C. Brandt, hereby declare:

1. I am a registered patent attorney (Reg. No. 50,218) at law firm of
Fay, Sharpe, Fagan, Minnich & McKee, LLP (Fay Sharpe), 1100 Superior Avenue,
Seventh Floor, Cleveland, OH 44114-2518.

2. On or about April 1, 2004, I was assigned to prepare a response to a first Office Action mailed March 15, 2004 from the Patent and Trademark for the above-identified patent application. I began reviewing the Office Action in April 2004 and noticed that the grounds for rejection referred to specific language in the claims and that the same specific language could not be found in the claims of the originally-filed claims in the historical records for this patent application maintained by Fay Sharpe for Lucent Technologies, Inc. (Lucent). Additionally, I found a discrepancy between the Office Action and the originally-filed claims as to the total number of claims pending. There were 56 total claims in the originally-filed claims and the Office Action indicated that only 54 claims were pending.

3. On April 7, 2004, I contacted Examiner AL-Aubaidi by telephone to discuss this matter. Examiner AL-Aubaidi and I compared claim 1 from the specification, claims, and abstract in the file history maintained at the PTO to claim 1 in the originally-filed claims and found that they were not the same. Examiner AL-Aubaidi and I also compared the total number of claims in the specification, claims, and abstract in the file history maintained at the PTO to the total number of claims in the originally-filed claims and found that they were not the same. There were 54 total claims in the specification, claims, and abstract in the file history maintained at the PTO and 56 total claims in the originally-filed claims. Examiner AL-Aubaidi and I agreed to discuss this matter further after each had an opportunity to investigate our respective files.

4. On April 12, 2004 Examiner AL-Aubaidi and I discussed this matter again via telephone. Examiner AL-Aubaidi indicated that she had not found anything in the file history maintained at the PTO to explain the problem. I indicated that I had not found anything in the historical records maintained by outside counsel for this patent application that might explain why the claims from the originally-filed 30-page specification, claims, and abstract were not in the PTO's file. I indicated that I had found U.S. Pat. No. 6,307,929, Serial No. 09/558,578. I also indicated that the '929 patent: i) includes claims that seem to match up to the specific language referred to in the Office Action, ii) was filed on April 26,

2000, iii) was issued on October 23, 2001, and iv) was assigned on its face to Lucent. I requested that Examiner AL-Aubaidi check the number of pages in the specification, claims, and abstract in the file history maintained at the PTO. Examiner AL-Aubaidi indicated that there were 35 pages in the specification, claims, and abstract in the file history maintained at the PTO. I indicated that there were 30 pages in the originally-filed specification, claims, and abstract. Examiner AL-Aubaidi and I discussed the title on the specification, claims, and abstract in the file history maintained by the PTO and found that it was the same as the title on the '929 patent. The title for both was found to be "Apparatus, Method and System for Providing Conditional Answering in Multiple Leg Telecommunication Sessions." Examiner AL-Aubaidi requested that I fax the originally-filed claims to her so that she could discuss this matter with Supervisor Matar.

5. On April 15, 2004, Supervisor Matar and Examiner AL-Aubaidi contacted me by telephone. Examiner AL-Aubaidi indicated that she had not found the claims faxed to her from the originally-filed 30-page specification, claims, and abstract in the file history maintained at the PTO or in any patent application file that she thought might have been related. Supervisor Matar and Examiner AL-Aubaidi indicated that they had compared the application in the file history maintained at the PTO for the above-identified patent application with the '929 patent and that the specification and claims appeared to be the same, but that the drawings were different. I informed Supervisor Matar and Examiner AL-Aubaidi that the historical records maintained by outside counsel included a return postcard from the PTO indicating that a 30-page specification, claims, and abstract was received by the PTO and that Examiner AL-Aubaidi had indicated that the specification, claims, and abstract in the file history maintained at the PTO was 35 pages. I asked Supervisor Matar if he would enter the originally-filed 30-page specification, claims, and abstract into the record. Supervisor Matar indicated that he could not grant the original filing date to any specification, claims, and abstract submitted now and that this would be a matter for the Petitions Office to decide.

7. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and

further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

15 June 2004

Date

Alan C Brandt

Alan C. Brandt, Reg. No. 50,218

Patent Attorney

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4-27-00

jc/96 U.S. PTO
04/26/00Express Mail No. EK429074425US
Calabrese 10-3-7-16jc/96 U.S. PTO
09/558613
04/26/00IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
PATENT APPLICATIONINVENTORS: Calabrese, Robert Thomas
Hudepohl, Thomas Edward
Riley, Douglas Harvey
Thompson, Robin Jeffrey

CASE: Calabrese 10-3-7-16

TITLE: Apparatus, Method and System For Maintaining Call Control at a
Gateway Mobile Switching Center Utilizing a Packet NetworkASSISTANT COMMISSIONER FOR PATENTS
WASHINGTON, D.C. 20231

SIR:

Enclosed are the following papers relating to the above-named application for patent:

Specification, Claims and Abstract (30 pages)
7 Sheets of informal drawings
Assignment with Cover Sheet
Declaration and Power of Attorney

CLAIMS AS FILED

The fee has been calculated as shown below:

Small Entity						Large Entity		
FOR	No. Filed	No. Allowed	No. Extra	Rate	Fee	OR	Rate	Fee
Basic Fee					\$345.00	OR		\$690.00
Total Claims	56	- 20 =	36	x \$9.00	\$	OR	x \$18.00	\$648.00
Independent Claims	5	- 3 =	2	x \$39.00	\$	OR	x \$78.00	\$156.00
Multiple Dep. Claims				+\$130.00	\$	OR	+\$260.00	\$0.00
Other Fees				\$	\$	OR	\$	\$0.00
TOTAL					\$	OR	TOTAL	\$1,494.00

Please file the application and charge Lucent Technologies, Inc. Deposit Account No.
12-2325 the amount of \$1,494.00 to cover the filing fee. Duplicate copies of this letter are

Express Mail No. EK429074425US
Calabrese 10-3-7-16

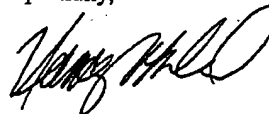
enclosed. In the event of non-payment or improper payment of required fee, the Commissioner is authorized to charge or to credit Deposit Account No. 12-2325 as required to correct the error.

Please address all correspondence to:

Nancy R. Gamburd
Gamburd & Associates, Ltd.
10 South LaSalle Street, Suite 3300
Chicago, Illinois 60603-1002

Telephone calls should be made to me at (312) 372-2920 extension 125.
Faxes should be transmitted to me at (312) 372-7762.

Respectfully,



Nancy R. Gamburd
Registration No. 38,147
Attorney for Applicants

Date: April 26, 2000

Lucent Technologies Inc.
600 Mountain Avenue
P.O. Box 636
Murray Hill, New Jersey 07974-0636

**APPARATUS, METHOD AND SYSTEM FOR
PROVIDING CONDITIONAL ANSWERING IN
MULTIPLE LEG TELECOMMUNICATION SESSIONS**

5 **Field of the Invention**

The present invention relates in general to telecommunication systems and services, and more particularly, to an apparatus, method and system for providing conditional answering in a multiple leg telecommunication session.

10 **Cross-Reference to Related Applications**

This application is related to Baiyor et al., U. S. Patent No. 6,009,159, entitled "Apparatus, Method And System For Controlling The Start Of Alerting Of Multiple Leg Telecommunication Sessions", filed June 15, 1998 and issued December 28, 1999, commonly assigned to Lucent Technologies, Inc., and incorporated by reference herein, with priority claimed for all commonly disclosed subject matter (the "first related patent").

This application is related to Baiyor et al., U. S. Patent No. 6,005,930, entitled "Apparatus, Method And System For Controlling Secondary Treatment By a Distant Switch Of Multiple Leg Telecommunication Sessions", filed June 15, 1998 and issued December 21, 1999, commonly assigned to Lucent Technologies, Inc., and incorporated by reference herein, with priority claimed for all commonly disclosed subject matter (the "second related patent").

This application is related to Baiyor et al., U. S. Patent Application Serial No. 09/097,527, entitled "Apparatus, Method And System For Providing Information To A Called Party In Multiple Leg Telecommunication Sessions", filed June 15, 1998, commonly assigned to Lucent Technologies, Inc., and incorporated by reference herein, with priority claimed for all commonly disclosed subject matter (the "third related application").

This application is related to Baiyor et al., U. S. Patent Application Serial No. 09/342,499, entitled "Apparatus, Method And System For Providing Variable Alerting Patterns For Multiple Leg Telecommunication Sessions", filed June 29, 1999,

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2/24/04

commonly assigned to Lucent Technologies, Inc., and incorporated by reference herein, with priority claimed for all commonly disclosed subject matter (the "fourth related application").

5 This application is related to Baiyor et al., U. S. Patent Application Serial No. 09/350,577, entitled "Apparatus, Method And System For Providing Call Progress Information For Multiple Leg Telecommunication Sessions For Intelligent Network Services", filed July 9, 1999, commonly assigned to Lucent Technologies, Inc., and incorporated by reference herein, with priority claimed for all commonly disclosed subject matter (the "fifth related application").

10 This application is related to Baiyor et al., U. S. Patent Application Serial No. 09/350,439, entitled "Apparatus, Method And System For Providing Variable Termination Patterns For Multiple Leg Telecommunication Sessions", filed July 9, 1999, commonly assigned to Lucent Technologies, Inc., and incorporated by reference herein, with priority claimed for all commonly disclosed subject matter (the "sixth related application").

15 This application is related to Baiyor et al., U. S. Patent Application Serial No. 09/404,901, entitled "Apparatus, Method And System For Subscriber Control Of Timed And Regional Membership In Multiple Member Termination Groups For Multiple Leg Telecommunication Sessions", filed September 24, 1999, commonly assigned to Lucent Technologies, Inc., and incorporated by reference herein, with priority claimed for all commonly disclosed subject matter (the "seventh related application").

20 This application is related to Baiyor et al., U. S. Patent Application Serial No. 09/455,623, entitled "Apparatus, Method And System For Telecommunication Conferencing Services In A Multiple Leg Telecommunication Session", filed December 7, 1999, commonly assigned to Lucent Technologies, Inc., and incorporated by reference herein, with priority claimed for all commonly disclosed subject matter (the "eighth related application").

Background of the Invention

30 With the advent of increasingly sophisticated telecommunication services, various services and systems are currently available that provide a called party with

information pertaining to an incoming call, prior to answering, resulting in a call screening capability. This call screening capability may be limited, however, due to the types of information typically provided. For example, a calling party number and calling party name service (commonly referred to as "caller ID") displays the directory number of the telephone originating the call, but does not provide any information concerning how the call was routed or what the called party directory number may have been.

Additional types of information for provision to a called party may be particularly useful for new forms of telecommunication services. One such new telecommunication service allows a single call, incoming to a telecommunication switch, to branch into multiple, independent outgoing calls (or legs) to different called parties, during the same period of time. Once such proposed service is included in the ANSI-41 specification promulgated by the American National Standards Institute for wireless telecommunication, such as cellular communication, and is referred to as "flexible alerting". In a multiple outgoing call leg service such as flexible alerting, an incoming call to a primary (or "pilot") directory number is branched into multiple outgoing call legs to secondary directory numbers (which were previously specified as part of a flexible alerting group associated with the primary directory number). The ANSI-41 flexible alerting specification, however, does not include any specific directions or guidelines for types of information to be provided to called parties in such independent, concurrent outgoing multiple leg calls.

The use of these multiple outgoing call leg telecommunication services, such as "flexible alerting", raise new issues for the provision of information to called parties. With such flexible alerting, there is a loss of a 1:1 correlation between the directory number dialed and the directory number alerted. For instance, any given telephone (i.e., directory number) may receive calls through multiple paths, such as calls made directly to its directory number (directly dialed), and calls made indirectly, through the flexible alerting group (primary directory number dialed, with subsequent routing to that given directory number). As a consequence, in screening incoming calls, a called party may want to know if his or her telephone was alerted directly, by a direct call to their directory number, or indirectly, through membership in any number of flexible alerting groups.

The provision of additional information to the called party, such as routing information or information pertaining to the purpose of the call, is significant for other purposes as well. For example, in a multiple leg telecommunication session, additional information may allow an alerted party to refrain from answering a call, allowing other, more appropriate members of a flexible alerting group to answer the call, such as those with particular language capabilities or familiarity with specified subjects.

As a consequence, a need remains for an apparatus, method and system both provide a called party with additional information for call screening, and to allow a called party to conditionally answer an incoming call to receive the additional information. Such additional information should include call routing information, call purpose information, or other types of information designated by the consumer. Such conditional answering should also provide an alerted party with the ability to conditionally answer an incoming call, without releasing or dropping other outgoing call legs while the alerted party is receiving the additional information. In addition, such an apparatus, method and system should also be user friendly, user transparent, and capable of implementation in existing telecommunication equipment.

Summary Of The Invention

A system, apparatus and method provide conditional answering by a called party in multiple leg telecommunication sessions, such as in a flexible alerting service. The various embodiments of the present invention both allow a called party to conditionally answer an incoming call and provide a called party with additional types of information, enabling a significant level of call screening. In the preferred embodiment, the additional, called party information includes call routing information, call purpose information, and other types of information designated by the consumer.

The preferred system embodiment includes a home location register (HLR) coupled to a mobile switching center (MSC). In the preferred system embodiment, a MSC receives an incoming call leg designating a primary directory number ("DN"). A subscriber or other user of flexible alerting (or other multi-leg communication services) typically predefines a group of other directory numbers, referred to herein as secondary DNs, which are to be associated with the primary DN,

such that when a call is placed to the primary DN, all of the secondary DNs are alerted. Such a list or grouping may be referred to as a flexible alerting group, or more broadly as an alerting group. In general, the incoming call to the primary DN is then processed and routed by a MSC, which then directs the incoming call to the multiple different mobile or wireline secondary DNs of the user's predefined alerting group, creating multiple different outgoing communication legs to these differing and independent directory numbers.

More specifically, in the preferred embodiment, when a MSC receives an incoming call leg to the primary DN, it requests call treatment instructions from the HLR, typically utilizing a location request. In accordance with the present invention, the HLR then directs the MSC to obtain "called party information" from the calling party. Typically, the MSC may provide the calling party with a menu of options, such as language selections, and choices of different kinds of products or services. In addition, the MSC may request the name of the calling party and the purpose of the call. This information may be transmitted to the HLR, while some of the information (such as the calling party name and purpose of the call) may be stored for re-transmission to a called party. Based upon this information, the HLR may select a subset of secondary DNs from the alerting group, such as those secondary DNs corresponding to called parties with fluency in a particular language or who support particular services or products. The HLR then provides the MSC with a listing of the secondary DNs to which outgoing call legs are to be routed, and the MSC then processes and generates outgoing call legs to these secondary DNs.

The MSC further provides conditional answering of these outgoing call legs. Such a conditional answering may be configured in a variety of ways, such as by entry of a predetermined code by a called (alerted) party, such as *SEND or *TALK, or simply by going off hook. When an outgoing call leg is conditionally answered, the MSC provides the called party information on the conditionally answered outgoing call leg, but does not then connect the conditionally answered outgoing call leg to the incoming call leg to form a communication session. The called party of the conditionally answered outgoing call leg may then utilize the called party information as desired, such as to screen the call, and may then unconditionally answer, hold or release the outgoing

call leg. Other outgoing call legs continue to be alerted and may also be conditionally answered, with the provision of called party information, or may remain unanswered, or may be unconditionally answered. Whichever outgoing call leg is first to be unconditionally answered will receive the call and be connected to the calling party, with the other call legs released (*i.e.*, dropped or torn down, with their corresponding alerting ceased), including other outgoing call legs which may have been conditionally answered previously.

The various embodiments of the present invention both allow a called party to conditionally answer an incoming call and provide a called party with additional types of information, enabling a significant level of call screening. In the preferred embodiment, the additional, called party information includes call routing information, such as a specification of the primary DN called, call purpose information, and other types of information designated by the consumer. For example, the information provided to the called party may include responses from the calling party, such as option or menu selections, or may identify specific flexible alerting groups, providing the called party with information pertaining to the purpose or routing of the call, and enabling the most suitable member of a flexible alerting group to respond to the call. The various embodiments of the present invention also provide an alerted party with the ability to conditionally answer an incoming call and receive the additional information, without being connected to the calling party and without releasing or dropping other outgoing call legs to other members of the alerting group. In addition, the apparatus, method and system of the present invention are user friendly, user transparent, and capable of implementation in existing telecommunication equipment.

Numerous other advantages and features of the present invention will become readily apparent from the following detailed description of the invention and the embodiments thereof, from the claims and from the accompanying drawings.

Brief Description of the Drawings

Figure 1A is a graphical diagram illustrating alerting of multiple outgoing communication sessions commencing upon processing of an incoming call to a network switch.

Figure 1B is a graphical diagram illustrating conditional answers during alerting of multiple outgoing communication sessions in accordance with the present invention.

Figure 1C is a graphical diagram illustrating connection of an unconditionally answered outgoing communication call leg with an incoming call leg to form a communication sessions, with the release of remaining outgoing call legs, in accordance with the present invention.

Figure 2 a block diagram illustrating a first system embodiment for providing conditional answering in multiple leg telecommunication sessions in accordance with the present invention.

Figure 3 is a block diagram illustrating a second system embodiment for providing conditional answering in multiple leg telecommunication sessions for wireless communication in accordance with the present invention

Figure 4 is a block diagram illustrating an apparatus embodiment for providing conditional answering in multiple leg telecommunication sessions in accordance with the present invention.

Figure 5 is a flow diagram illustrating a method embodiment for providing conditional answering in multiple leg telecommunication sessions in accordance with the present invention.

Detailed Description of the Invention

While the present invention is susceptible of embodiments in many different forms, there are shown in the drawings and will be described herein in detail specific embodiments thereof, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the specific embodiments illustrated.

As mentioned above, a need remains for an apparatus, method and system both to provide a called party with additional types of information and to allow a called party to conditionally answer an incoming call. In accordance with the present invention, an apparatus, method and system are provided which both provide a called party with such additional information for call screening, and which allow a called party to

conditionally answer an incoming call to receive the additional information. In the preferred embodiment, the additional information includes call routing information, call purpose information, and other types of information designated by the consumer. For example, the information provided to the called party may include responses from the calling party or may identify specific flexible alerting groups, thereby providing the called party with information pertaining to the purpose or routing of the call. The various embodiments of the present invention also provide an alerted party with the ability to conditionally answer an incoming call and receive the additional information, without being connected to the calling party and without releasing or dropping other outgoing call legs to other members of the alerting group. In addition, the apparatus, method and system of the present invention are user friendly, user transparent, and capable of implementation in existing telecommunication equipment.

As mentioned above, the new ANSI-41 specification provides a communications standard for flexible alerting for wireless communications, as a terminating feature or terminating call service. In this specification, a call is placed to a special directory number ("DN") referred to as a pilot directory number ("pilot DN") or as a primary directory number ("primary DN"). A subscriber or other user of flexible alerting or other multi-leg communications, typically predefines a group of other directory numbers, referred to herein as secondary DNs, which are to be associated with the pilot or primary DN, such that when a call is placed to the primary DN, all of the secondary DNs are alerted. Such a list or grouping may be referred to as a flexible alerting group, or more broadly as an alerting group or a secondary DN group. The incoming call to the pilot DN is then to be processed by a mobile switch, which then directs the incoming call to the multiple different mobile or wireline secondary DNs of the user's predefined alerting group, creating multiple different outgoing communication legs to these differing and independent directory numbers. Whichever outgoing call leg is first to answer will receive the call and be connected to the calling party, with the other call legs released (i.e., dropped or torn down, with their corresponding alerting ceased).

Such flexible alerting or other multi-leg communication may be useful, for example, in businesses involving sales, repairs, or dispatching services. Such flexible alerting may also be useful for other business and personal uses, such as multiple calls to

a home, office, and cellular telephone. For example, a child may call a single DN, namely, a parent's pilot DN, which will then alert the telephones at all the associated directory numbers or lines defined in the parent's alerting group or list, such as their home DN, business office DN, home office DN, and cellular or other mobile telephone DN. Presuming the parent is present, the parent will be alerted at any and all of these locations from the placement of a single telephone call.

As a consequence, for the purposes of the present invention, a person referred to as a called party may receive telecommunication calls in at least two different ways. First, the called party may receive calls directly via incoming calls placed to their directory number. Second, if their directory number is defined as a secondary DN in an alerting group, they may receive calls indirectly via incoming calls placed to the pilot DN (or primary DN) of the alerting group. Similarly, a called party may also receive calls indirectly through call forwarding, via incoming calls placed to a different directory number of the called party. The present invention is directed to enabling the called party to conditionally answer an outgoing call leg to receive types of information to distinguish between these two types of calls, direct and indirect calls (such as flexible alerting calls), and to determine whether they are the most appropriate member (of a flexible alerting group) to unconditionally answer the incoming call leg.

Typically, when an individual answers a call, such as by going off-hook or by pressing a SEND (TALK, or equivalent) button, that call is answered "unconditionally", such that the called party is immediately connected to the calling party for a communication session. In accordance with the present invention, however, an individual may "conditionally" answer a call and receive additional information, transparently to the calling party, and without the called party being connected to the calling party for a communication session. Following a conditional answer, the called party may further decide to accept (unconditionally answer) or reject (decline to unconditionally answer) the call; in the event the called party does accept the call, then and only then is the called party connected to the calling party for a communication session.

More specifically, in accordance with the present invention, when a called party has been alerted (on an outgoing call leg of a multiple outgoing call leg session),

the called party may "conditionally answer" the outgoing call leg, such as by going off hook, by pressing a "SEND" button (or its equivalents, such as a TALK button), or by entering a predesignated code, such as "**SEND" or "**3", for example. Following such a conditional answer, information is provided to the called party, such as a verbal message provided by the calling party or a designation of which flexible alerting group was called. During this time, other members of the flexible alerting group may also be conditionally (or unconditionally) answering their corresponding outgoing call legs. Following a conditional answer, the called party may accept (unconditionally answer) the outgoing call leg, or may release (reject) the outgoing call leg (such as by pressing an "end" button or by going on hook). Whichever outgoing call leg is first to provide an unconditional answer will receive the call and be connected to the calling party, with the other call legs released (*i.e.*, dropped or torn down, with any corresponding alerting ceased).

The ANSI-41 specification does not address any issue concerning either conditional answering of an outgoing call leg or the provision of information to a called party pertaining to the routing or purpose of the outgoing call. Rather, the ANSI-41 specification merely addresses and requires that an incoming call to a pilot DN be routed to associated secondary DNs of the flexible alerting group, with the calling party ultimately connected to an answering party. Figure 1A is a graphical diagram illustrating alerting of multiple outgoing communication sessions commencing upon processing of an incoming call (incoming call leg 105) to a network switch 130.

As illustrated in Figure 1A, an incoming call leg 105 is received and processed by a network switch 130 (discussed in greater detail below). Following processing of the incoming call leg, call placement and other processing commences for four independent outgoing communication sessions A, B, C, and D, namely outgoing call legs 110, 115, 120 and 125 respectively (illustrated as dashed lines). These various outgoing call legs may be routed to any type of wireline or wireless secondary DN. Similarly, the outgoing call legs may be routed through one or more nodes, which may be any combination of PSTN (public switched telephone network), satellite, packet-based, or wireless nodes, or may require an additional mobile paging message to locate a mobile telephone. As these calls are processed, the switch 130 presumably (and with reasonable certainty) has no *a priori* or other advanced knowledge concerning which, if any, of the

5 outgoing call legs 110, 115, 120 and 125 will be unconditionally answered. As a consequence, in accordance with the invention of another related patent application of Lucent Technologies, Inc., an open connection is maintained between the incoming call leg 105 and all of the outgoing call legs 110, 115, 120 and 125, unless and until one of the outgoing call legs is, in fact, unconditionally answered by a called party. Once one of the outgoing call legs 110, 115, 120 and 125 is unconditionally answered, then a voice path, connection or link will be established between the incoming call leg 105 and the unconditionally answered outgoing call leg.

10 Figure 1B is a graphical diagram illustrating an exemplary conditional answering of two outgoing call legs of the flexible alerting illustrated in Figure 1A. As illustrated in Figure 1B, called parties A and C have conditionally answered their respective outgoing call legs 110 and 120 (illustrated by double dashed lines). In the preferred embodiment, the called party may conditionally answer their outgoing call leg in any number of predefined ways, such as by going off-hook or pressing the * button followed by the SEND button. Since the outgoing call legs 110 and 120 are only conditionally answered, an open connection continues to be maintained between all of the outgoing call legs (110, 115, 120 and 125) and the incoming call leg 105. In addition, the other outgoing call legs which have not (yet) been conditionally or unconditionally answered (outgoing call legs 115 and 125) are not being released or dropped by the network switch 130. Moreover, during the period that called party A is conditionally answering the outgoing call leg 110, information is being transmitted to the called party A, and during the period that called party C is conditionally answering the outgoing call leg 120, similar information is also being transmitted to the called party C..

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25 Continuing to refer to Figure 1B, while either called party A or called party C is receiving called party information, any one of the outgoing call legs may be unconditionally answered. For example, during or after reception of such information, called party A may decide to unconditionally answer the call, or to not answer the call. Once one of the outgoing call legs 110, 115, 120 and 125 is unconditionally answered, a connection or link is established between the incoming call leg 105 and the unconditionally answered outgoing call leg, and the other unanswered or conditionally answered outgoing call legs are released, as discussed below with reference to Figure 1C.

Figure 1C is a graphical diagram illustrating connection of an unconditionally answered outgoing communication call leg with an incoming call leg to form a communication sessions, with the release of remaining outgoing call legs, in accordance with the present invention. As illustrated in Figure 1C, for example, called party C has unconditionally answered the outgoing call leg 120 (illustrated as a solid line). Consequently, a connection or link 135 is or has been established between the incoming call leg 105 and the unconditionally answered outgoing call leg 120 to form a full duplex communication session, and the other outgoing call legs 110, 115 and 125 are being or have been released or dropped (illustrated as dotted lines). While in this case outgoing call leg 120 has been the first of the outgoing call legs to provide an unconditional answer (and therefore be connected to the incoming call leg 105), it should be noted that any outgoing call leg which is first to provide an unconditional answer will be connected to the incoming call leg, not just an outgoing call leg which previously provided a conditional answer.

As mentioned above, information (referred to herein as "called party information") is provided by the switch 130 on all conditionally answered outgoing call legs, in this case outgoing call legs 110 and 120, as illustrated in Figure 1B. Accordingly, any called party that has conditionally answered their respective outgoing call leg receives the called party information, and thereby may screen the outgoing call leg. An important aspect of the present invention is that any conditionally answered outgoing call leg (such as 110 and 120) is not, without more, connected to the incoming call leg from the calling party. As a consequence, the conditional answering occurs transparently to the calling party. Moreover, when any of the outgoing call legs (110 and 120) have been conditionally answered, the network switch 130 does not release or drop the other outgoing call legs, namely, outgoing call legs 115 and 125. Rather, such outgoing call legs are dropped or released only following an unconditional answer of an outgoing call leg, such as outgoing call leg 120 of Figure 1C.

In the preferred embodiment, the called party information consists of an audible message for perception by a listener. For instance, when the information is a message, the message may alert the called party that the call session is a multiple leg telecommunication session. The message also may provide the called party with a

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distinguishing group identifier, such as an alerting group name or number, or the primary directory number called (or other designation of a flexible alerting group), in order to assist the called party in distinguishing one flexible alerting group from another, such as distinguishing a business group from a family group. The information provided to the called party may also indicate the number of outgoing call legs which are being alerted, also to assist in determining whether the called party should unconditionally answer the outgoing call leg. For more advanced embodiments, the calling party may be asked by the system (such as systems 200 or 300, below) to provide certain types of information, such as language requirements or product requirements; this information also is then provided on outgoing call legs which have been conditionally answered.

Other information which may be useful for a called party may also be transmitted. Such information may include a notification of the language of the calling party, such English or Spanish, to enable the most appropriate member of a flexible alerting group to respond to the call. Other types of calling party information, such as information pertaining to particular products, also may be provided that may be appropriate or useful in directing the incoming call leg to the most suitable called party. For example, information pertaining to particular products may be useful for an alerting group for sales or for repairs. This type of information may be designated when a flexible alerting group is originally established and may be modified over time. In the preferred embodiment, a menu of choices pertaining to this type of information is provided to the calling party, who may then make an appropriate choice, such as by pressing "1" for English, "2" for Spanish, or pressing "3" for cellular and "4" for PCS.

As indicated above, various options are available to the called party for providing a conditional answer (and screening incoming calls) and/or providing an unconditional answer. In the preferred embodiment, the called party may provide an encoded conditional answer that includes screening capability. For example, for a called party who is a member of several alerting groups, upon being alerted, the called party may enter a "*3" or a "3SEND", providing a conditional answer indicating that the called party is to be connected to a call only from their alerting group number 3. Similarly, the called party may enter a "#3" or similar code for a negative conditional answer and screening, indicating that the called party is to be connected to a call only from any

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alerting group other than their alerting group number 3. When any of these conditions is met, the called party does not need to perform any further actions to be connected to the incoming call leg.

5 In addition to output of an audible message, other means such as visual
displays (on mobile units 130, discussed below) may also provide the called party with
the ability to screen calls. First, in addition to caller ID display, additional information
such as a "*" (star), a "#" (pound), a special digit sequence (such as "99"), or any other
distinctive identifier or other mark, may be added as a prefix or suffix to a displayed
calling number and/or name in order to designate a flexible alerting call. In addition, the
10 called directory number could also be displayed, indicating to the called party whether
the outgoing call leg was a flexible alerting call (displaying the pilot or primary DN), or
whether the call was a direct call (displaying the called party's directory number).

15 Fig. 2 is a block diagram illustrating a first system embodiment 200 in
accordance with the present invention. The system 200 includes one or more mobile
switching centers ("MSCs") 215 and one or more wireline switching centers 205, which
may be connected via trunk and signaling lines to each other and to a broader network
210, such as a PSTN or ISDN network, thereby providing multiple telecommunication
connections to other locations, such as providing a link to a satellite 235. The system 200
also includes a database 220, which is preferably connected or coupled to a wireline
switching center 205 and to the MSC 215. A database 220 may also be directly included
20 or integrated within the various switching centers 205 and 215.

25 The wireline switching center 205 is generally connected to a plurality of
telephones 240 or other customer premise equipment. Alternatively, via base stations or
other wireless transceivers (not separately illustrated), the MSCs 215 typically have a
wireless link to the various mobile units 230, such as cellular telephones within a
particular geographic region. The wireline and mobile switching centers 205 and 215
usually are also typically physically separated due to regulatory and other historical
reasons. These switching centers, however, may be combined into one or more switching
centers having both wireline and wireless functionalities.

30 Continuing to refer to Fig. 2, either the wireline switching center 205 or
one of the mobile switching centers 215 receives an incoming call directed to a primary

DN. The switching center 205 or 215 then transmits a request to database 220 for an alerting list containing the secondary DNs associated with the primary or pilot DN (such as a termination list). The database 220 transmits a response to the corresponding switching center 205 or 215. The response may contain or list the associated DNs and any corresponding routing and timing parameters (disclosed in the related applications), or may request that the switch obtain additional information from the calling party.

For example, in response to a request from a switching center 205 or 215, the database 220 may provide the switch with an announcement list, for options to be played to the calling party, as previously specified in creating (or modifying) the particular alerting group. When announcement messages have been played, the calling party then enters associated choices, such as language choices (e.g., pressing "1" for English, "2" for Spanish), or other service or equipment choices (e.g., pressing "1" for cellular services, "2" for wireline services, "3" for data services, and so on). In addition, the calling party may also be requested to speak his or her name, or company, etc. This responsive information is then transmitted by the switch (205 or 215) to the database 220. Based on this responsive information, the database 220 may then make various determinations (based upon the calling party's input) and generate an appropriate listing of secondary DNs (selected as a subset from the available secondary DNs of the total alerting group), such the secondary DNs of those alerting group members who are fluent in Spanish. The database 220 then transmits (to the switching center 205 or 215) this listing of secondary DNs (with associated routing and timing parameters, and with any further information to be transmitted to the called parties), for corresponding routing and conditional answering of the outgoing call legs.

For conditional answering, the system 200 may be configured in various ways. In a first embodiment, the system is pre-configured for conditional answering, such that entry of pre-established code or pressing a particular key by the called party is automatically interpreted as a conditional answer, such as entry of a "**SEND" when answering (with entry of "SEND" interpreted as an unconditional answer). In an alternative embodiment of the present invention, the system 200 is configured for unconditional answering (as a default). To provide conditional answering, a new parameter may be included one of the response messages from the database 220 to the

switch (205 or 215), which indicates that the outgoing call legs may be conditionally answered (referred to herein as a conditional answering ("CA") parameter). In that alternative embodiment, the absence of the conditional answering parameter in the response message is a default setting indicating normal or typical handling of answered outgoing call legs (i.e., any answer is an unconditional answer).

As indicated above, following routing of the various outgoing call legs by the switch (205 or 215) and alerting of the various called parties, in accordance with the present invention, any of the outgoing call legs may be conditionally answered, with the called party receiving any of the various types of called party information discussed above. Following reception of such information, a conditionally answering called party may then unconditionally answer the outgoing call leg, or may release the outgoing call leg. Alternatively, with or without a conditional answer, any of the outgoing call legs may also be unconditionally answered. As mentioned above, any such unconditionally answered outgoing call leg is connected to the incoming call leg, for a communication session with the calling party, with all remaining outgoing call legs then being released or torn down.

Fig. 3 is a block diagram illustrating a second, preferred system embodiment 300 for wireless communication in accordance with the present invention, such as for ANSI-41 flexible alerting. In this system 300, two types of MSCs represent the mobile switching centers 215. The first type of MSC, referred to as an originating MSC 310, receives an incoming call leg designating a primary DN, generates the plurality of outgoing call legs to the associated secondary DNs, and directly provides service to the mobile units 230 within its designated or predetermined geographic region 330. The second type of MSC, referred to as a serving MSC 315, provides service to mobile units 230 that have traveled or roamed into their designated or predetermined geographic regions 340 and 350. A stand-alone home location register ("HLR") 320 is illustrated, to implement the database 220 and other ANSI-41 signaling functionality. (Alternatively, an integrated HLR may also be utilized, in which HLR functionality is included within each MSC 310 and 315.) The various MSCs 310 and 315 are preferably connected to the HLR 320 via ANSI-41 signaling interfaces and corresponding links 325. As in the system of Fig. 2, the various MSCs 310 and 315 are also connected or coupled

to a wireline switching center 205 and to a network 210, for multiple network connections, such as PSTN, ISDN, or satellite connections. (As in Figure 2, base stations or other wireless transceivers are not separately illustrated).

Referring to Figure 3, when an originating MSC 310 receives an incoming call designating a primary DN, the originating MSC 310 transmits a query or other message to an HLR 320. Such a query is typically in the form of a data packet, and includes a reference to the pilot DN or other primary DN. While the operation of the system 300 is explained with reference to an originating MSC 310, it should be understood that any MSC 215, at any given time, may be serving as either or both an originating MSC 310 or a serving MSC 315. The incoming call to the originating MSC 310 may be a wireless call from one of the mobile units 230 or may be a wireline call originating from the network 210, such as a PSTN call. In the preferred embodiment, utilizing the ANSI-41 specification, the query transmitted by the originating MSC 310 to the HLR 320 is a "LocationRequest", which is an operation used by an originating MSC 310 to obtain call treatment instructions from the HLR 320. The location request or query is initiated with a "TCAP INVOKE (LAST), carried by a TCAP QUERY WITH PERMISSION package, and includes corresponding mandatory and optional parameters as defined in the ANSI-41 specification for a LocationRequest INVOKE, such as pilot DN, billing identification, and originating MSC identifier.

Utilizing its database, the HLR 320 first determines whether the primary DN is for a flexible alerting group (or other multi-leg communications group), and if so, the HLR 320 prepares a response or other message for transmission to the originating MSC 310. As mentioned above, if the HLR 320 is configured to obtain or request more information (from the calling party, via the MSC 310), the HLR 320 prepares and transmits a response message, indicating the type of information to be collected, as discussed above. In the preferred embodiment, the response message is an ANSI-41 compatible RemoteUserInteractionDirective with an AnnouncementList. This response message directs the originating MSC 310 to output or play the various designated prompts or other messages to the calling party, and to obtain the requested information, such as touch tone (DTMF) responses or a recording of a calling party name. The information collected by the originating MSC 310 is transmitted to the HLR 320,

preferably in the form of an ANSI-41 compatible RemoteInteractionDirective with DialedDigits. Based upon this information and its configuration for the particular alerting group, the HLR 320 then determines what information should be included in a response, including a listing of selected secondary DNs, appropriate routing and timing parameters, a conditional answer parameter (to indicate that the alerting group should be provided with this service, also as discussed above), and other called party information to be provided on the outgoing call legs.

Following this determination, or following a location request when the HLR 320 does not request additional information from the originating MSC 310, the HLR 320 generates a message (for transmission to the originating MSC 310) containing or listing the selected secondary DNs that are to be alerted, and containing some or all of the called party information, such as text for display. In the preferred embodiment, the response data packet listing the secondary DNs is provided in a TerminationList of an ANSI-41 compatible LocationRequest RETURN RESULT ("LRRR"). In addition, depending upon system 300 configuration, as mentioned above, the HLR 320 may also include within the response message a conditional answer parameter, to provide this service for the flexible alerting session. As disclosed in the related applications, the HLR 320 may also have obtained routing information for roaming mobile units 230, and if so, additional messaging may have occurred between the HLR 320 and the serving MSCs 315.

The originating MSC 310, utilizing the data contained in the response data packet (the secondary DNs, their corresponding routing parameters, called party information, and optionally a conditional answer parameter, included within an LRRR), begins processing and routing each outgoing call leg to each secondary DN. If and when one or more of these outgoing call legs is conditionally answered, by going off-hook or entering a predesignated code such as *SEND, the originating MSC 310 transmits called party information to the called party on each of the conditionally answered outgoing call leg(s), and maintains an open connection between the incoming call leg and the conditionally answered outgoing call leg(s). During this time, other outgoing call legs may be conditionally or unconditionally answered, and any unanswered outgoing call

legs may also be released or dropped according to their respective no answer time parameters ("NAT").

5 A called party of one of the conditionally answered outgoing call legs, having received the called party information, may subsequently decide whether to unconditionally answer the call leg or to release the call leg. In addition, any of the called parties of the other outgoing call legs may also decide to unconditionally answer their respective outgoing call leg. Whichever called party is first to unconditionally answer an outgoing call leg, such as by entering a code or pressing the "SEND" button, that outgoing call leg is connected to the incoming call leg by the MSC 310, and the other remaining outgoing call leg are released or dropped (also by the MSC 310). Conversely, 10 for any conditionally answered outgoing call leg, in the event that the called party does not want to unconditionally answer, the called party may simply go on-hook or press an "END" button. The MSC 310 then releases that outgoing call leg, all transparently to the calling party.

In the preferred embodiment, the outgoing call leg is conditionally answered by entering a code, such as by pressing the * button followed by the SEND button (i.e., *SEND). As mentioned above, other alternatives are available, for instance, for utilizing different screening options, such as off-hook providing an unconditional answer, *SEND providing a conditional answer, and various positive or negative screening alternatives for different alerting groups, such as 3SEND to provide a conditional answer for the user's predefined flexible alerting group number three, or 2SEND to provide a conditional answer for all of the user's predefined flexible alerting groups except number 2.

25 Figure 4 is a block diagram illustrating an apparatus embodiment 400 in accordance with the present invention. As discussed in greater detail below, the apparatus 400 may be included within an MSC (310 or 315), or distributed among an MSC (310 or 315) and HLR 320 of a system 300, or may be included within a switch 205 or 215, or distributed among a switching center 205 or 215 and database 220 of system 200. The apparatus 400 includes a network interface 415, a processor 410, and a memory 30 420.

5 The network interface 415 is utilized to receive an incoming call leg to a pilot DN or primary DN, and to transmit the plurality of outgoing call legs to the secondary DNs associated with a primary DN. For example, in system 300, the network interface 415 may be couplable to the network 210 (via trunk and signaling lines) for transmission and reception of PSTN calls. The network interface 415 may also be couplable (via trunk and signaling lines) to a base station (not illustrated) for transmission and reception of wireless calls. The network interface 415 may also be utilized to receive and transmit messages, such as to receive and transmit a location request or query, and to receive and transmit a response message containing a listing of secondary DNs, called party information, and a conditional answer parameter (if any).

10 The memory 420 is used to store data pertaining to primary DNs, associated secondary DNs, any various subgroups of the secondary DNs (such as those pertinent to language preferences, etc.), routing parameters, answering parameters, a conditional answer parameter, other call placement and routing information, and the call progress information of the related inventions. The memory 420 may be a magnetic hard drive, an optical storage device, an integrated circuit, or any other type of data storage apparatus. The memory 420 also performs such information storage comparable to the information storage of the database 220 or HLR 320.

15 Continuing to refer to Figure 4, the processor 410 may include a single integrated circuit ("IC"), or may include a plurality of integrated circuits or other components connected, arranged or grouped together, such as microprocessors, digital signal processors ("DSPs"), application specific integrated circuits ("ASICs"), field programmable gate arrays ("FPGAs"), associated memory (such as RAM and ROM), and other ICs and components. As a consequence, as used herein, the term processor should be understood to equivalently mean and include a single processor, or arrangement of processors, microprocessors, controllers, or some other grouping of integrated circuits which perform the functions discussed above and also discussed in detail below with reference to Figure 5, with associated memory, such as microprocessor memory or additional RAM, SRAM, DRAM, MRAM, ROM, EPROM or E²PROM. The methodology of the invention, as discussed above with reference to Figures 1-3 and as discussed below with reference to Figure 5, may be programmed and stored, in the

processor 420 with its associated memory and other equivalent components, as a set of instructions (or other configuration) for subsequent execution when the processor 410 is operative (*i.e.*, powered on and functioning).

As mentioned above, such an apparatus 400 may be included within, or distributed among, an MSC (310 or 315) or HLR 320 of a system 300, or may be included within, or distributed among, switching centers 205 or 215 and database 220 of system 200. For example, when included within the system 200, the various switching centers 205 and 215 may incorporate the database 220; in that event, the apparatus 400 may be completely included within either the wireline switching center 205 or the wireless switching center 215. Also for example, when included within the system 300, the apparatus 400 may be distributed among the originating MSC 310 and the HLR 320, with the memory 420 incorporated within the HLR 320, with the processor 410 having components within the originating MSC 310 and the HLR 320, and with the network interface 415 incorporated within the MSC 310 (or 315). In such a distributed embodiment for the system 300, the apparatus 400 would also include corresponding ANSI-41 signaling interfaces within the originating MSC 310 and the HLR 320, for communication of the various requests and responses discussed above.

Figure 5 is a flow diagram illustrating a method embodiment for providing conditional answering in multiple leg telecommunication sessions in accordance with the present invention. The method begins, start step 500, with the reception of an incoming call leg designating a primary DN, step 505, such as reception by an MSC (310 or 315) of an incoming call leg designating a pilot DN of the ANSI-41 specification. Next, in step 510, the method determines all of the secondary DNs associated with the primary DN (as part of the alerting group) and all related parameters, such as determines whether the alerting group (and/or primary DN) is configured for conditional answering, as well as determining any timing, routing and/or no answer time parameters (as disclosed in the related applications). As indicated above, step 510 is usually performed by an HLR 320 in the preferred embodiment, following a query from the originating MSC 310 to the HLR 320, such as an ANSI-41 LocationRequest.

Following step 510, the method determines whether the multiple leg telecommunication session is configured for conditional answering, step 515, such as

whether the alerting group parameters include a conditional answer parameter. When the multiple leg telecommunication session is not configured for conditional answering in step 515, the method proceeds to step 575 and processes the multiple leg telecommunication session according to its default or other designated mode, such as the default processing mode discussed in greater detail below (with respect to steps 575 through 605). When the multiple leg telecommunication session is configured for conditional answering (step 515) the method proceeds to step 520, and determines or obtains any and all called party information for the alerting group. As discussed above, this step is preferably performed as several substeps, with corresponding messaging, by and between the HLR 320 and MSC 310, with interaction with and input from the calling party, such as through responses to prompts or recorded verbal responses.

Following step 520, the method processes and routes each outgoing call leg, of the plurality of outgoing call legs, corresponding to each of the secondary DNs of the alerting group, step 525. In the preferred embodiment, such processing also preferably utilizes the various timing, routing and no answer time parameters of the related applications. The method then monitors each of the outgoing call legs to determine whether a call leg has been conditionally answered, step 530. When an outgoing call leg has been conditionally answered in step 530, such as by entering a code or sequence such as *TALK or #SEND, the method proceeds to step 535 and provides called party information to the called party on the conditionally answered outgoing call leg. For example, depending upon the configuration of the alerting group specified by the subscriber, an MSC 310 will provide called party information such as the primary DN called, the total number of outgoing call legs alerted, distinguishing information (such as a distinctive identifier of the alerting group), or other information requested from the calling party, as discussed above. As discussed above, for a conditionally answered outgoing call leg, no connection or communication link is created between the incoming call leg and the conditionally answered outgoing call leg. Following step 535, the method determines whether the called party of the conditionally answered outgoing call leg has terminated (or released) the call, step 540, such as by the called party going on hook, pressing an "END" button, or otherwise hanging up the call. When the conditionally answered call has been terminated in step 540, the method proceeds to step

565 and releases that outgoing call leg. When the conditionally answered outgoing call leg has not been released in step 540, or when the outgoing call leg was not conditionally answered in step 530, the method proceeds to step 545.

5 In step 545, the method determines whether the outgoing call leg was unconditionally answered, such as by pressing a button or entering a code (e.g., TALK or SEND). When the outgoing call leg has been unconditionally answered in step 545, the method (via MSC 310) connects the unconditionally answered outgoing call leg to the incoming call leg to form a communication session, step 550. Following this creation of a communication session, the method releases all remaining outgoing call legs, step 555,
10 and the method may end, return step 610.

When the outgoing call leg has not been unconditionally answered in step 545, the method (via MSC 310) determines whether a no answer time period has expired, step 560, as disclosed in the related applications. When the no answer time period has expired for the (unanswered) outgoing call leg in step 560, that unanswered outgoing call leg is released, step 565. When the no answer time period has not expired for the (unanswered) outgoing call leg in step 560, and following step 565, the method determines whether there are remaining outgoing call legs to be monitored, step 570. When there are remaining outgoing call legs to be monitored in step 570, the method returns to step 530 and monitors each remaining outgoing call leg (for conditional answering, unconditional answering, and/or termination). When there are no remaining outgoing call legs to be monitored in step 570, the method also may end, return step 610.

As mentioned above, when an alerting group has not been configured for conditional answering (as determined in step 515), the method will provide default processing for the multiple leg telecommunication session, such as the default processing of step 575 through 605. In the preferred embodiment, such default (or regular) processing is quite similar to the processing discussed above, but without the additional conditional answering features. In step 575, for the default mode, the method also processes and routes each outgoing call leg, of the plurality of outgoing call legs, corresponding to each of the secondary DNs of the alerting group. In the preferred
25 embodiment, such processing also preferably utilizes the various timing, routing and no
30 answer time parameters of the related applications.

Without providing conditional answering, in step 580, the method determines whether the outgoing call leg was answered (i.e., unconditionally answered), such as by pressing a button or entering a code (e.g., TALK or SEND). When the outgoing call leg has been answered in step 580, the method (via MSC 310) connects the answered outgoing call leg to the incoming call leg to form a communication session, step 585. Following this creation of a communication session, the method also releases all remaining outgoing call legs, step 590, and the method may end, return step 610.

When the outgoing call leg has not been answered in step 580, the method (via MSC 310) also determines whether a no answer time period has expired, step 595, as disclosed in the related applications. When the no answer time period has expired for the (unanswered) outgoing call leg in step 595, that unanswered outgoing call leg is released, step 600. When the no answer time period has not expired for the (unanswered) outgoing call leg in step 595, and following step 600, the method also determines whether there are remaining outgoing call legs to be monitored, step 605. When there are remaining outgoing call legs to be monitored in step 605, the method returns to step 580 and monitors each remaining outgoing call leg for answering. When there are no remaining outgoing call legs to be monitored in step 605, the method also may end, return step 610.

In addition to the methodology illustrated in Figure 5, other equivalent variations are available. For example, rather than specifying a single conditional answer state or parameter for the entire alerting group as a whole, each secondary DN may be configured individually for conditional answering, such as having an individual conditional answer parameter. An alerting group would then have a corresponding set of conditional answer parameters, with processing and routing of outgoing call legs potentially proceeding along both the conditional answering path (steps 515 through 570) and the default path (steps 575 through 605) discussed above. A corresponding methodology for call processing will be apparent to those of skill in the art. For example, for that situation, the method would determine whether the particular secondary DN was configured for conditional answering. When not configured for conditional answering, the corresponding outgoing call leg would be handled in a default mode, such that when answered, the answered outgoing call leg would be connected to the incoming call leg, with the release of the remaining unanswered call legs. When the secondary DN is

configured for conditional answering, called party information would also be obtained and provided on a conditionally answered call leg, with the balance of the call processing proceeding as described above.

5 Numerous advantages of the present invention may be apparent from the above discussion. First, the apparatus, method and system of the present invention both allow a called party to conditionally answer an incoming call and provide a called party with additional types of information, enabling a significant level of call screening. In the preferred embodiment, the additional, called party information includes call routing information, call purpose information, and other types of information designated by the consumer. For example, the information provided to the called party may include 10 responses from the calling party, such as option or menu selections, or may identify specific flexible alerting groups, providing the called party with information pertaining to the purpose or routing of the call. The various embodiments of the present invention also provide an alerted party with the ability to conditionally answer an incoming call and receive the additional information, without being connected to the calling party and without releasing or dropping other outgoing call legs to other members of the alerting group. In addition, the apparatus, method and system of the present invention are user friendly, user transparent, and capable of implementation in existing telecommunication equipment. 20

From the foregoing, it will be observed that numerous variations and modifications may be effected without departing from the spirit and scope of the novel concept of the invention. It is to be understood that no limitation with respect to the specific methods and apparatus illustrated herein is intended or should be inferred. It is, of course, intended to cover by the appended claims all such modifications as fall within 25 the scope of the claims.

We claim:

1. A method of providing conditional answering in a multiple leg telecommunication session, the method comprising:

(a) receiving an incoming call leg designating a primary directory number;

(b) determining a plurality of secondary directory numbers associated with the primary directory number;

(c) processing and routing each outgoing call leg associated with each secondary directory number, of the plurality of secondary directory numbers;

(d) when an outgoing call leg, of the plurality of outgoing call legs, has been conditionally answered, providing called party information on the conditionally answered outgoing call leg; and

(e) when an outgoing call leg, of the plurality of outgoing call legs, has been unconditionally answered, providing a connection between the unconditionally answered outgoing call leg and the incoming call leg to form a communication session.

2. The method of claim 1, wherein step (b) further comprises: determining the called party information.

3. The method of claim 2, further comprising: providing a listing of a plurality of options to a calling party; in response, receiving an option selection from the calling party; and based upon the option selection, determining the called party information.

4. The method of claim 3, wherein the plurality of options includes a language selection.

5. The method of claim 3, wherein the plurality of options includes a service selection.

6. The method of claim 3, wherein the plurality of options includes a product selection.

7. The method of claim 3, wherein the plurality of options are designated in an ANSI-41 compatible Announcement List.
8. The method of claim 2, further comprising:
providing a listing of a plurality of options to a calling party;
in response, receiving an option selection from the calling party; and
based upon the option selection, determining the plurality of secondary directory numbers.
9. The method of claim 2, further comprising:
requesting a name from a calling party;
storing in a memory a calling party name received in response; and
including the calling party name in the called party information.
10. The method of claim 1, wherein a conditional answering is indicated by entry of a predetermined code on an outgoing call leg of the plurality of outgoing call legs.
11. The method of claim 1, wherein a conditional answering is indicated by an off hook signal on an outgoing call leg of the plurality of outgoing call legs.
12. The method of claim 1, further comprising:
when a conditionally answered outgoing call leg has not provided an unconditional answer within a predetermined period of time, releasing the conditionally answered outgoing call leg.
13. The method of claim 1, further comprising:
subsequent to the formation of the communication session, releasing all remaining outgoing call legs of the plurality of outgoing call legs.

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14. The method of claim 1, wherein the called party information includes the primary directory number.

5 15. The method of claim 1, wherein the called party information includes a distinctive identifier for the multiple leg telecommunication session.

16. The method of claim 1, wherein the called party information includes an indication of an amount of outgoing call legs in the plurality of outgoing call legs.

10 17. A system for providing conditional answering in a multiple leg telecommunication session, the system comprising:

a database, the database having stored in a memory a plurality of secondary directory numbers associated with a primary directory number; and

15 a switching center coupled to the database, the switching center having an interface for receiving an incoming call leg designating the primary directory number and for processing and routing each outgoing call leg associated with each secondary directory number, of the plurality of secondary directory numbers; the switching center further providing, when an outgoing call leg of the plurality of outgoing call legs has been conditionally answered, called party information on the conditionally answered outgoing call leg; and the switching center further providing, when an outgoing call leg of the plurality of outgoing call legs has been unconditionally answered, a connection between the unconditionally answered outgoing call leg and the incoming call leg to form a communication session.

20 18. The system of claim 17, wherein the database determines the called party information.

25 19. The system of claim 17, wherein the switching center further provides a listing of a plurality of options to a calling party, and in response, receives an option selection from the calling party; and wherein the database, based upon the option selection, determines the called party information.

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20. The system of claim 19, wherein the plurality of options includes a language selection.
- 5 21. The system of claim 19, wherein the plurality of options includes a service selection.
22. The system of claim 19, wherein the plurality of options includes a product selection.
- 10 23. The system of claim 19, wherein the plurality of options are designated in an ANSI-41 compatible Announcement List transmitted from the database to the switching center.
- 15 24. The system of claim 17, wherein the switching center further provides a listing of a plurality of options to a calling party, and in response, receives an option selection from the calling party; and wherein the database, based upon the option selection, determines the plurality of secondary directory numbers.
- 20 25. The system of claim 17, wherein the switching center further requests a name from a calling party, stores in a memory a calling party name received in response, and includes the calling party name in the called party information.
- 25 26. The system of claim 17, wherein a conditional answering is indicated by entry of a predetermined code on an outgoing call leg of the plurality of outgoing call legs.
- 30 27. The system of claim 17, wherein a conditional answering is indicated by an off hook signal on an outgoing call leg of the plurality of outgoing call legs.

28. The system of claim 17, wherein the switching center, when a conditionally answered outgoing call leg has not provided an unconditional answer within a predetermined period of time, releases the conditionally answered outgoing call leg.

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29. The system of claim 17, wherein the switching center, subsequent to the formation of the communication session, releases all remaining outgoing call legs of the plurality of outgoing call legs.

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30. The system of claim 17, wherein the called party information includes the primary directory number.

31. The system of claim 17, wherein the called party information includes a distinctive identifier for the multiple leg telecommunication session.

32. The system of claim 17, wherein the called party information includes an indication of an amount of outgoing call legs in the plurality of outgoing call legs.

33. The system of claim 17, wherein the switching center is a mobile switching center and the database is a home location register.

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✓ 34. An apparatus for providing conditional answering in a multiple leg telecommunication session, the apparatus comprising:

a network interface for reception of an incoming call leg designating a primary directory number and for transmission of a plurality of outgoing call legs;

5 a memory having a plurality of secondary directory numbers associated with the primary directory number; and

a processor coupled to the memory and the network interface, wherein the processor, when operative, includes instructions to process and route each outgoing call leg associated with each secondary directory number, of the plurality of secondary
10 directory numbers; the processor including further instructions, when an outgoing call leg of the plurality of outgoing call legs has been conditionally answered, to provide called party information on the conditionally answered outgoing call leg; and the processor including further instructions, when an outgoing call leg of the plurality of outgoing call legs has been unconditionally answered, to provide a connection between the
15 unconditionally answered outgoing call leg and the incoming call leg to form a communication session.

35. The apparatus of claim 34, wherein the processor determines the called party information.

36. The apparatus of claim 35, wherein the processor includes further instructions to provide a listing of a plurality of options to a calling party, and in response, to receive an option selection from the calling party, and based upon the option selection, to determine the called party information.

37. The apparatus of claim 36, wherein the plurality of options includes a language selection.

38. The apparatus of claim 36, wherein the plurality of options includes a service selection.

39. The apparatus of claim 36, wherein the plurality of options includes a product selection.

40. The apparatus of claim 36, wherein the plurality of options are designated in an ANSI-41 compatible Announcement List transferred from the memory to the processor.

41. The apparatus of claim 35, wherein the processor includes further instructions to provide a listing of a plurality of options to a calling party, and in response, to receive an option selection from the calling party, and based upon the option selection, to determine the plurality of secondary directory numbers.

42. The apparatus of claim 35, wherein the processor includes further instructions to request a name from a calling party, to store in the memory a calling party name received in response, and to include the calling party name in the called party information.

43. The apparatus of claim 34, wherein a conditional answering is indicated by entry of a predetermined code on an outgoing call leg of the plurality of outgoing call legs.

44. The apparatus of claim 34, wherein a conditional answering is indicated by an off hook signal on an outgoing call leg of the plurality of outgoing call legs.

45. The apparatus of claim 34, wherein the processor includes further instructions, when a conditionally answered outgoing call leg has not provided an unconditional answer within a predetermined period of time, to release the conditionally answered outgoing call leg.

46. The apparatus of claim 34, wherein the processor includes further instructions, subsequent to the formation of the communication session, to release all remaining outgoing call legs of the plurality of outgoing call legs.

5 47. The apparatus of claim 34, wherein the called party information includes the primary directory number.

48. The apparatus of claim 34, wherein the called party information includes a distinctive identifier for the multiple leg telecommunication session.

10 49. The apparatus of claim 34, wherein the called party information includes an indication of an amount of outgoing call legs in the plurality of outgoing call legs.

15 50. A system for providing conditional answering in a multiple leg telecommunication session, the system comprising:
a home location register, the home location register having stored in a memory, in association with a pilot directory number, a plurality of secondary directory numbers and instructions for determining called party information; and
a mobile switching center coupled to the home location register, the mobile switching center having an interface for receiving an incoming call leg designating the pilot directory number and for processing and routing each outgoing call leg associated with each secondary directory number, of the plurality of secondary directory numbers; the mobile switching center, following reception of a directive from the home location register, obtaining information from a calling party for a determination
20 of called party information; the mobile switching center further providing, when an outgoing call leg of the plurality of outgoing call legs has been conditionally answered, called party information on the conditionally answered outgoing call leg; and the mobile switching center further providing, when an outgoing call leg of the plurality of outgoing call legs has been unconditionally answered, a connection between the unconditionally answered outgoing call leg and the incoming call leg to form a communication session.
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51. The system of claim 50, wherein the directive to the mobile switching center from the home location register is an ANSI-41 compatible AnnouncementList designating a plurality of options, and wherein the mobile switching center further provides a listing of the plurality of options to the calling party, and in response, receives an option selection from the calling party and transmits the option selection to the home location register; and wherein the home location register, based upon the option selection, determines the called party information.

52. The system of claim 50, wherein the directive to the mobile switching center from the home location register is an ANSI-41 compatible AnnouncementList designating a plurality of options, and wherein the mobile switching center further provides a listing of the plurality of options to the calling party, and in response, receives an option selection from the calling party and transmits the option selection to the home location register; and wherein the home location register, based upon the option selection, determines the plurality of secondary directory numbers.

53. The system of claim 50, wherein the plurality of options are predesignated by a subscriber from a set of selections, the set of selections including a language selection, a service selection, and a product selection.

54. The system of claim 50, wherein a plurality of types of information forming called party information are predesignated by a subscriber from a set of types of information, the set of types of information including calling party name information, the pilot directory number, a distinctive identifier for the multiple leg telecommunication session, and an indication of an amount of outgoing call legs in the plurality of outgoing call legs.

APPARATUS, METHOD AND SYSTEM FOR
PROVIDING CONDITIONAL ANSWERING IN
MULTIPLE LEG TELECOMMUNICATION SESSIONS

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Abstract of the Disclosure

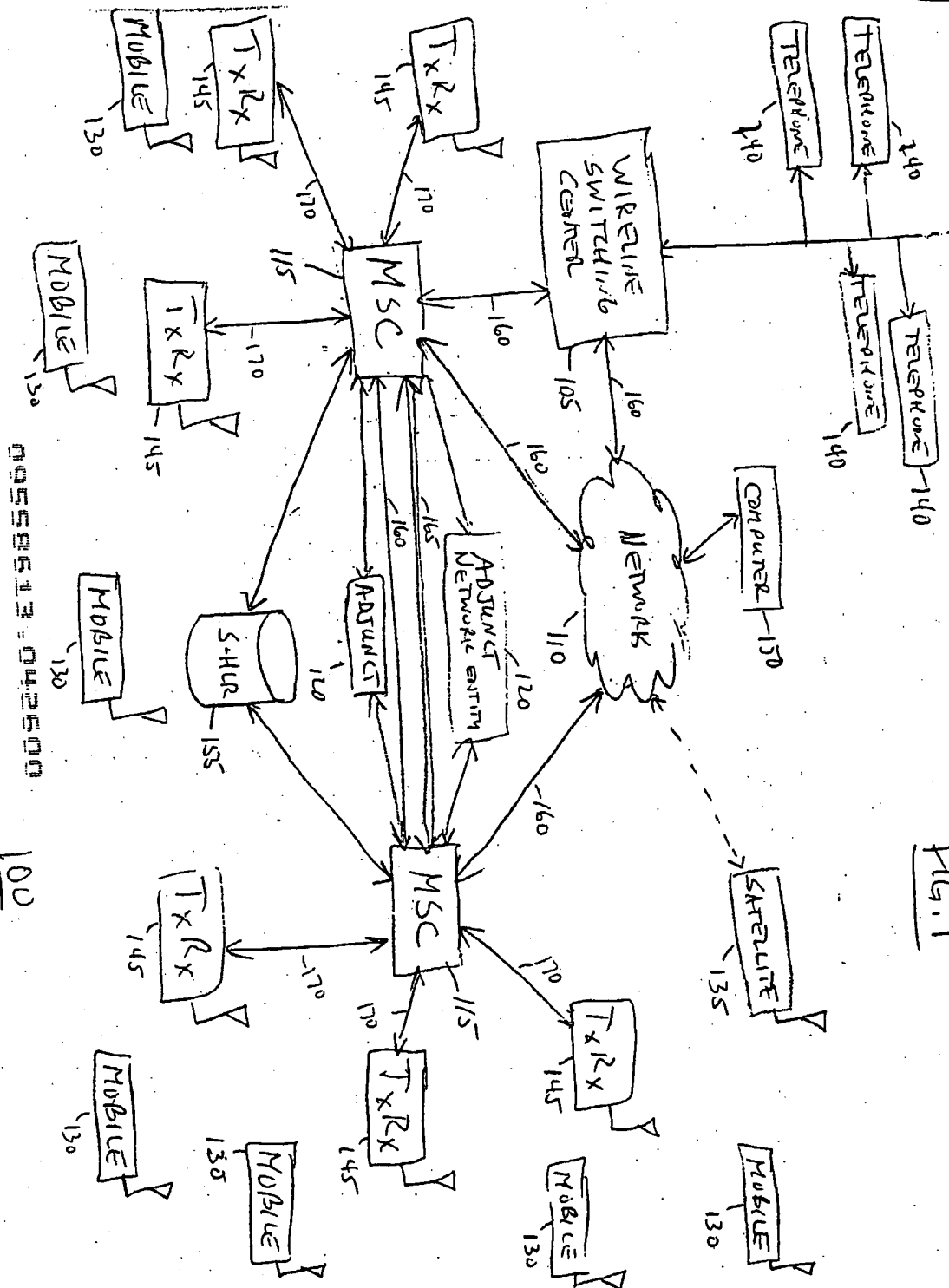
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An apparatus, method and system provide for conditional answering in multiple leg telecommunication sessions, such as in a flexible alerting service. The preferred system includes a home location register (HLR) coupled to a mobile switching center (MSC). The HLR has, stored in a memory, a plurality of secondary directory numbers associated with a primary directory number, such as an ANSI compatible pilot directory number. The MSC has an interface for receiving an incoming call leg designating the primary directory number and for processing and routing each outgoing call leg associated with each secondary directory number. Following reception of a directive from the HLR, the MSC obtains information from a calling party to create called party information. When an outgoing call leg has been conditionally answered, the MSC provides the called party information on the conditionally answered outgoing call leg. Upon reception of the information, the called party may decide to accept the call, through an unconditional answer, or may hold or release the call. In the preferred embodiment, the called party information may include options or selections entered by the calling party, the name of the calling party, routing information, language selections, and product or service selections. Following an unconditional answer of an outgoing call leg, the MSC provides a connection between the unconditionally answered outgoing call leg and the incoming call leg to form a communication session.

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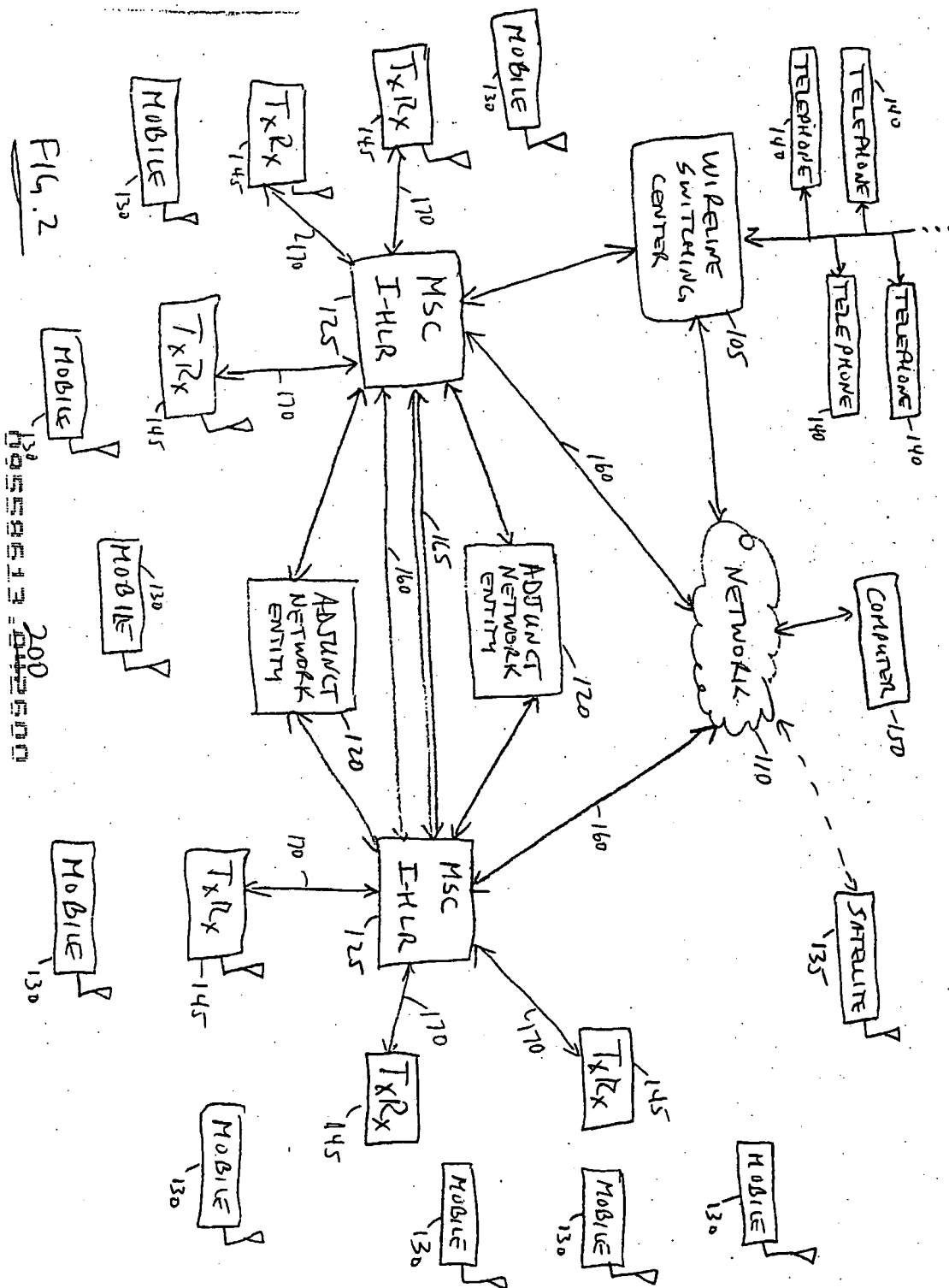


FIG. 2

20050513 200500

00558613-042600

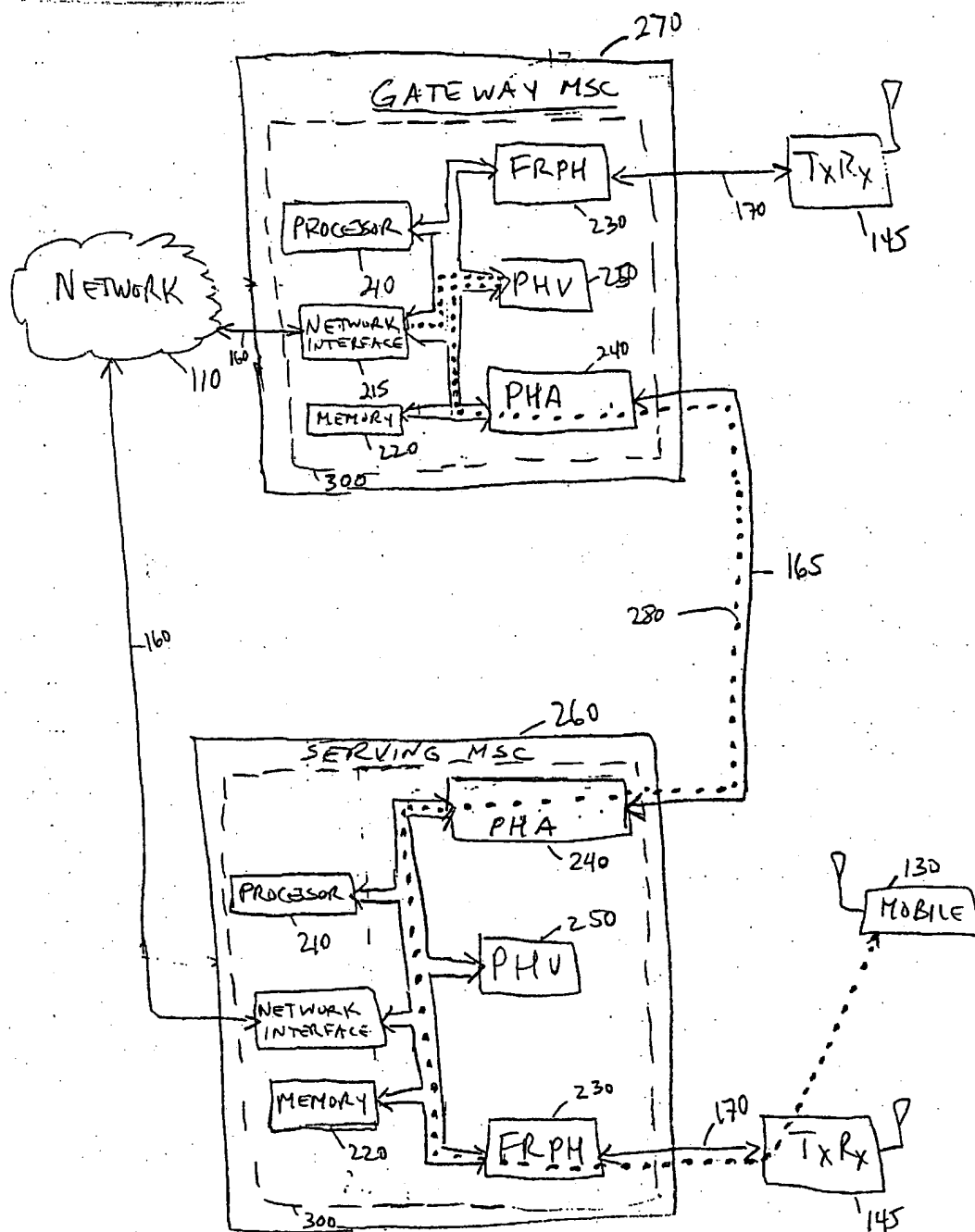
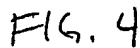


FIG. 3

מס' תעודת זהות:



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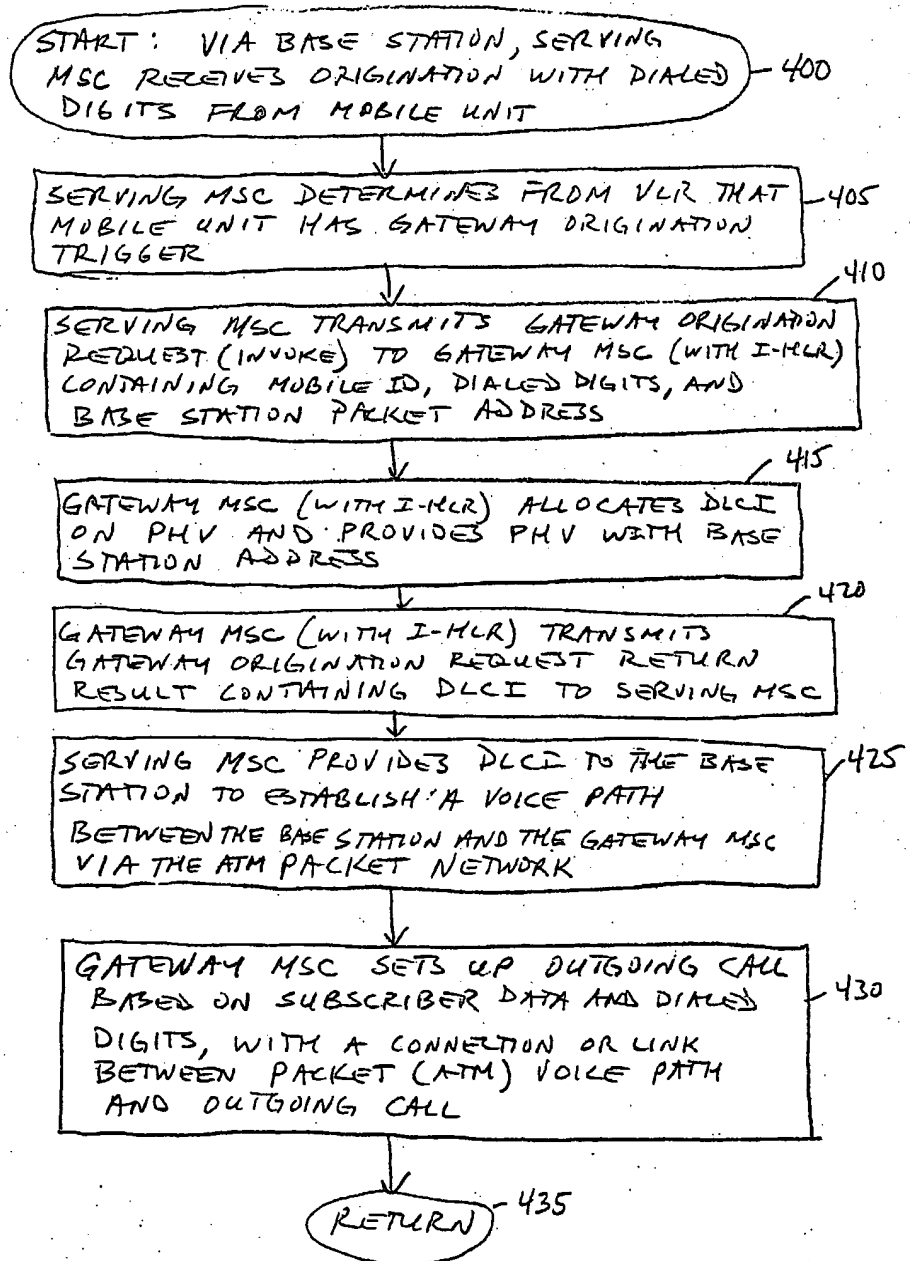
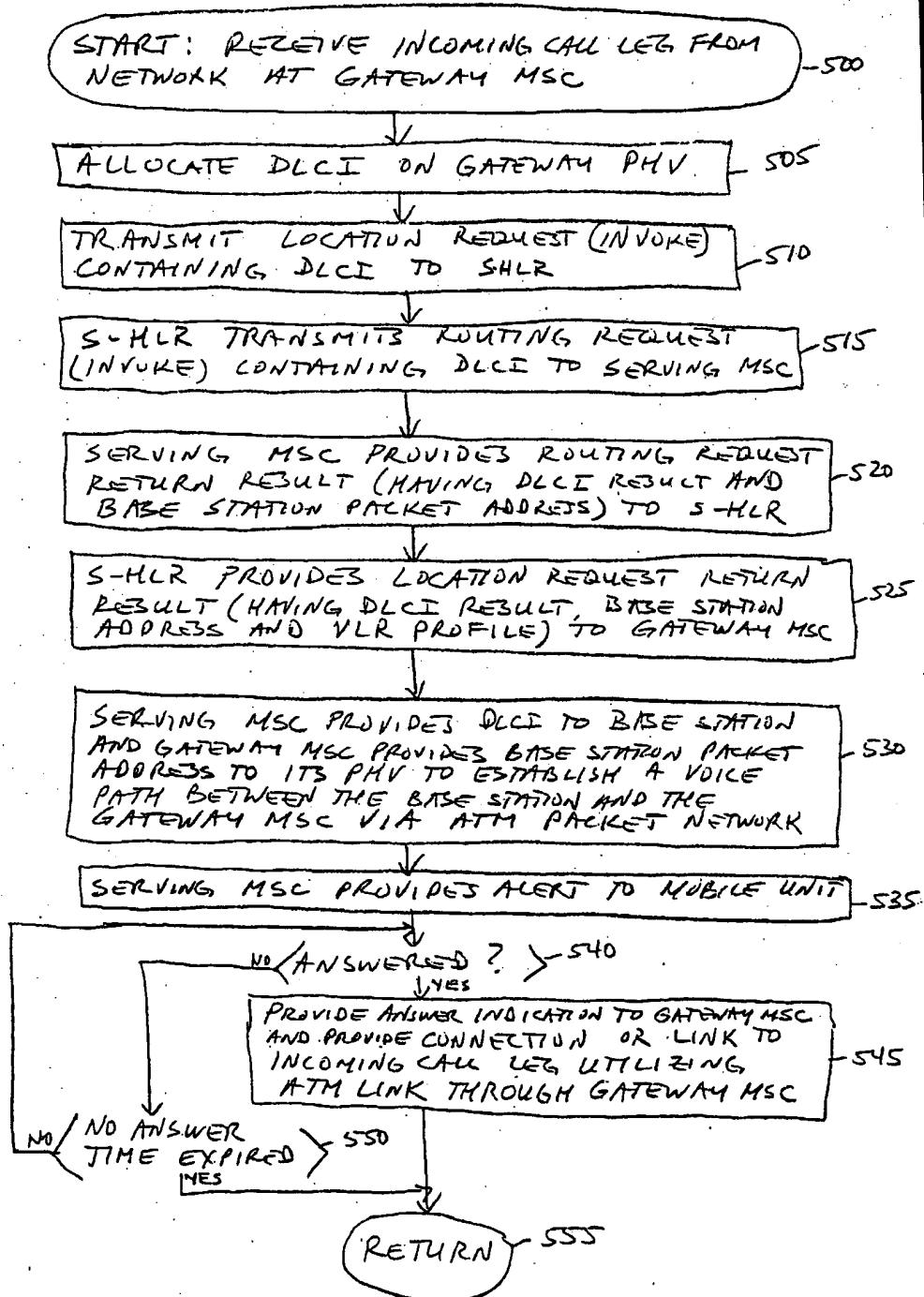


FIG. 5

FIG. 6



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FIG. 7

START: VIA BASE STATION, SERVING MSC
RECEIVES ORIGINATION WITH DIALED DIGITS
FROM MOBILE UNIT

600

SERVING MSC DETERMINES FROM VLR THAT
MOBILE UNIT HAS GATEWAY ORIGINATION
TRIGGER

605

SERVING MSC TRANSMITS (VIA S-HLR) GATEWAY
ORIGINATION REQUEST (INVOKE) TO GATEWAY
MSC CONTAINING MOBILE ID, DIALED DIGITS, AND
BASE STATION PACKET ADDRESS

610

GATEWAY MSC ALLOCATES DLCI ON ITS PHV
AND PROVIDES PHV WITH BASE STATION /
PACKET ADDRESS

615

GATEWAY MSC TRANSMITS (VIA S-HLR) A
GATEWAY ORIGINATION REQUEST RETURN RESULT
CONTAINING THE DLCI TO THE SERVING MSC

620

SERVING MSC PROVIDES DLCI TO THE BASE
STATION TO ESTABLISH A VOICE PATH BETWEEN
THE BASE STATION AND THE GATEWAY MSC
VIA THE ATM PACKET NETWORK

625

YES / GATEWAY MSC HAVE (CURRENT)
VLR PROFILE FOR MOBILE UNIT? /

630

NO

GATEWAY MSC TRANSMITS QUALIFICATION REQUEST
(INVOKE) TO S-HLR TO OBTAIN VLR

635

S-HLR TRANSMITS QUALIFICATION REQUEST
RETURN RESULT CONTAINING VLR PROFILE
TO GATEWAY MSC

640

GATEWAY MSC SETS UP OUTGOING CALL
BASED UPON SUBSCRIBER PATH AND
DIALED DIGITS, WITH A CONNECTION OR
LINK BETWEEN THE PACKET (ATM) VOICE
PATH AND THE OUTGOING CALL

645

RETURN

650

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Lucent Technologies, Inc.
Case No. Calabrese 10-3-7-16

IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

Declaration and Power of Attorney

As one of the below named inventors, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am an original, first and joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled **APPARATUS, METHOD AND SYSTEM FOR MAINTAINING CALL CONTROL AT A GATEWAY MOBILE SWITCHING CENTER UTILIZING A PACKET NETWORK** the specification of which is attached hereto.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by an amendment, if any, specifically referred to in this oath or declaration.

I acknowledge the duty to disclose all information known to me which is material to patentability as defined in Title 37, Code of Federal Regulations, 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

None

I hereby claim the benefit under Title 35, United States Code, 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, 112, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

None

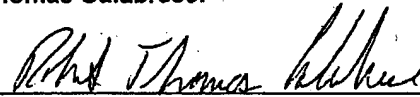
I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

I hereby appoint the following attorney(s) with full power of substitution and revocation, to prosecute said application, to make alterations and amendments therein, to receive the patent, and to transact all business in the Patent and Trademark Office connected therewith:

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Richard J. Botos	(Reg. No. 32016)
Jeffery J. Brosemer	(Reg. No. 36096)
Kenneth M. Brown	(Reg. No. 37590)
Craig J. Cox	(Reg. No. 39643)
Donald P. Dinella	(Reg. No. 39961)
Guy Eriksen	(Reg. No. 41736)
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Claude R. Narcisse	(Reg. No. 38979)
Joseph J. Opalach	(Reg. No. 36229)
Neil R. Ormos	(Reg. No. 35309)
Eugen E. Pacher	(Reg. No. 29964)
Jack R. Penrod	(Reg. No. 31864)
Daniel J. Piotrowski	(Reg. No. 42079)
Gregory C. Ranieri	(Reg. No. 29695)
Scott J. Rittman	(Reg. No. 39010)
Eugene J. Rosenthal	(Reg. No. 36658)
Bruce S. Schneider	(Reg. No. 27949)
Ronald D. Slusky	(Reg. No. 26585)
David L. Smith	(Reg. No. 30592)
Patricia A. Verlangieri	(Reg. No. 42201)
John P. Veschi	(Reg. No. 39058)
David Volejnicek	(Reg. No. 29355)
Charles L. Warren	(Reg. No. 27407)
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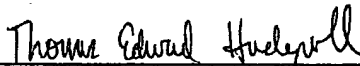
I hereby appoint the attorney(s) on ATTACHMENT A as associate attorney(s) in the aforementioned application, with full power solely to prosecute said application, to make alterations and amendments therein, to receive the patent, and to transact all business in the Patent and Trademark Office connected with the prosecution of said application. No other powers are granted to such associate attorney(s) and such associate attorney(s) are specifically denied any power of substitution or revocation.

Robert Thomas Calabrese:Inventor's
signature

Date 4-25-00

Residence: 1555 Pathway Drive
Naperville, Illinois 60565

Citizenship: United States of America

Post Office Address: 1555 Pathway Drive
Naperville, Illinois 60565**Thomas Edward Hudepohl:**Inventor's
signature

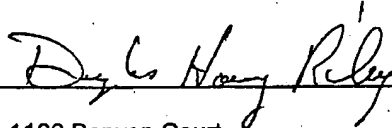
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Residence: 532 Dempsey Place
Geneva, Illinois 60164

Citizenship: United States of America

Post Office Address: 532 Dempsey Place
Geneva, Illinois 60164

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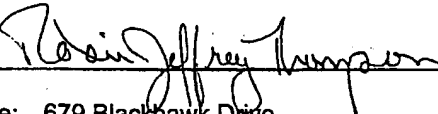
Douglas Harvey Riley:Inventor's
signature

Date

4/25/00

Residence: 1166 Banyon Court
Naperville, Illinois 60540

Citizenship: United States of America

Post Office Address: 1166 Banyon Court
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signature

Date

4/19/2000

Residence: 679 Blackhawk Drive
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ATTACHMENT A

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